THE

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OF

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AGRICULTURE.

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Specification of the Patent granted to Durs Egg, *of the Parish of St. Martin in the Fields, within the Liberty of Westminster, Gun-maker; for certain Improvements upon Fire Arms and their Locks.*

Dated March 23, 1803.

TO all to whom these presents shall come, &c. Now know ye, that in compliance with the said proviso, I the said Durs Egg do hereby declare, that my said improvements upon fire arms and their locks are described and ascertained in manner following; that is to say: The great advantage in the improvements upon the lock for all sorts of fire arms, consists in a much superior quick action than any others, and is constructed in a much smaller centre axle on the tumbler, which acts in, and is supported by, a second bridle, which goes over the cock fixed on the outside of the lock. By the same construction I can make the axle of the tumbler as large as required to fix the cock on a sufficiently large square to secure the cock from getting loose, or being quite lost.

Also, a great advantage is in pitching the axle-hole in the lock-plate higher than usual, which gives the cock a greater power in striking and cutting the hammer more regularly, better fire, and more direct into the pan. Also a new plan to take the lock to pieces, without taking out any screws to clean, and put it together again, is by a construction of a centre pin, that forms the axle through the bridles and tumbler, and when drawn out the cock and tumbler come out together in one piece, through the upper part of the plate, and may be put in its place, properly fixed as before, in two or three seconds; which must be a great advantage, as the persons who take the locks to pieces very seldom put them together right, and the screws in their proper places. The open part of the plate is filled up with a cover, either to slide or with a joint and screw, or to slide in and out with the centre pin.

Another new Way to take the Lock to Pieces.—The cock and tumbler go in and out together through the upper part of the plate and bridle, and the bridle remains fixed on the plate with (at least) three screws in the swivel locks, one before the crane of the tumbler, or at the bottom of the tumbler, another by the sear-screw, and one through the bridle and eye of the sear-spring, which supports and prevents the bridle being screwed too tight on the sear by the sear-screw, so as to hinder it from acting. The opening of the plate and bridle is filled up with a cover, either to slide, or with a joint and screw, and the plain or military locks with a stud on the bridle, in which case the bridle must be taken off first. The axle of the tumbler is larger than usual, to fix the cock on a larger square, and firmer than others, to prevent the cock getting loose or lost, and to procure as quick action as a small centre. The axle of the tumbler is reduced

duced on each side, bears only on a quarter centre, similar to the bearer of an axle in a scale-beam, which gives the cock great power in going down, and the quickest action.

A new method of priming, by which one cannot put too much powder or too little when the hammer is shut, is by an opening at the front of the hammer and pan, with a cover fixed on the hammer, with a spring to open and shut, like the hammer; also with a plain cover, to slide on a screw or otherwise.

An improved Pan and Hammer to expel the Damp and Water.—The hammer seat is lined with copper, or any other soft metal or composition, to form its level and perfect joint. The fence that joins against the barrel, with a double arch to guide the water on each side of the pan, which will prevent the water getting to the powder in the pan; also a larger arch on the hammer, to go over part of the barrel, with a guide to the guides on the sides of the pan. *An improved hammer*, to prevent the great disappointment of missing fire, as those hitherto made are too much subject to, through the mode the steel is put on, *viz.* by a welding heat, by which they are too often spoiled, as also by hardening improperly. I mean to make them in two pieces; the whole face of the hammer to be made of the best and purest steel, and so constructed as that it may be put on the rest of the hammer in different ways, so that it may be well hardened on or off: it may be fixed with a hook or hooks, or screws, so as the steel and spare ones may be put on easy and firm.

To expel the water from the whole lock, I mean to make a box to cover the whole lock, completely from the back part of the cock, with a joint at the back part of the pan: a part of the box to go over a piece of iron or frame left on the barrel over the touch-hole, which forms

part of a guide, to prevent the water getting to the lock; which guide reaches and goes down before and behind the lock, to join at the back part of the pan; and a joint before the hammer, to open and shut with the hammer or without. The cover is kept shut by a spring catch, and is opened by the action of the cock, and a spring to throw it open. Another way to open and shut the box, is to slide forwards over and before the hammer, to open and shut with the hammer or without. Both these covers of the above boxes are made with part to go over the cock when shut, and when open room enough to draw the cock up with a lever, that will come through part of the box to cock it. Also another way, is with a lever fastened to the axle of the tumbler or cock, which goes through the box and the lever, on the outside, to move the cock up and down. Another way, is with a frame round the lock, from the back part of the cock, and the piece of iron or frame left on the barrel, to form that part of the frame, and a cover to go over the lock, to fix on the frame, to put on and off with a joint or without. Some of them may be made large enough for the lock to act when on, with an opening at the pan to let the fuse and smoke out, with a cover to open and shut, and others without. These lock-covers may be made in different forms and ways to open and shut, according to the fancy of the maker and purchasers.

A new way to load all sorts of fire arms at the breech, much quicker and easier than any other whatever heretofore made, and exempt from any accidents in loading and firing, either with cartridges, ball, or shot, is with an opening at the breech, best on the top of the barrel, with a hole through the upper part of the barrel to put the charge in, and a slide across, or nearly across, through the metal of the barrel, to cover or shut up the opening,

opening, with a provision of metal or arch on each side of the opening on the barrel to replace and support the parts cut away, with a lever on the side of the barrel, fixed to the barrel with a joint and screw, and another fixed to the slide; and the handle of the lever lays up towards the nose of the barrel, and is long enough, and projects from the barrel wide enough to put about two or three fingers between to pull it open and shut it by; and a stop on the barrel, near the slide, to keep it firm, and from pulling it too far.

The above slide, which shuts up the opening of the barrel, I mean also to make to open and shut with a rising screw.

A new nipper or shear, to cut the cartridge for priming; which is so constructed as to cut the paper off with an easy stroke, and not liable to spoil or cut one's self. It may be made with a joint, to fix on the lock or gun, with a screw and joint, to move, or lay close to the gun, when not wanted, or with a spring to put on and off.

An improved Way of priming from the inside of the Barrel when charging through the Touch-hole. — The touch-hole is so constructed as to be sufficiently large to prime much better than any made before, and not to lose more, or so much of the strength in shooting as a common touch-hole; which is by the touch-hole shutting itself up when fired by the recoil of the barrel, which is made to slide back at least so far as to cover the touch-hole with a piece of iron, fixed at the breech, or at the pan of the lock, to stop the fuse, and the spring at the breech to keep it in its usual place. Another way is with a slide on the lock, to act with the cock to shut and uncover the touch-hole, and in the cover a provisional small touch-hole. It may also be made with the action of the hammer

hammer to slide with a balance, to cover and uncover the touch-hole, and also with a valve fixed on the barrel, with a balance or spring to shut itself up when fired by the fuse or pressure of the charge. For the before-mentioned way of priming through the touch-hole, care must be taken to have a cartridge or wadding that fits the bore of the barrel, so as to press the air down through the touch-hole into the pan, which has a provision to let the air through, which is made through the front of the pan, or seat of the hammer in the joint, or by a small hole or holes, and is often necessary to other fire arms, where the pan fits nearly or quite air-tight. The fire arms constructed for the barrel to slide in the stock, by the pressure of recoil to give with a spring, is a great advantage in shooting better and truer, and will much diminish the unpleasant striking or kicking.

An improved Sight at the Breech.—The body of it is fixed not to move, and the notched part made to slide within the other, which secures it from moving by accident. Also a new cover for the sight, which may be adopted and used on all sorts of fire-arms, and will cause to shoot much truer than any ever used before, and will be a particular advantage for bullet-guns and pistols. It is made in the form of a tube when shut, and several inches long, suitable to the size of the fire arms; and when the tube is open it will form about half a circle, and the upper part is made to take off, or slide under the other half, and to slide forwards or backwards if required, and when wanted to cover and shade the light the upper part of the tube is turned up or put on, by which the most perfect aim can be obtained. A tube may also be made to slide in and out, to make it longer, and to bring as near the eye as required.

An

An improved stock to pistols, with a support on the upper part of the stock or grip, as a stop against the hand, to prevent the pistol moving when fired, which stop or support may be made with the stock, or put on and fixed, of steel or other materials, with a provision to move farther or nearer to the hand; also a support to rest against the arm or shoulder, which is best fixed at the end of the butt or grip, with a joint to open and shut in the grip, or on the side of it, or on the side of the pistol.

Also a new constructed pistol for firing off cannon, to prime and load together without wadding, which has a chamber near the pan to contain the charge, and shoots the flash through the tube or barrel to the touch-hole. And an improved cock and side nail, to prevent accidents by the turnscrew slipping out, which is prepared by a notch jagged, and a hole in the centre, to keep the turnscrew in its proper place.

For ramrods, an improved worm; the spiral part goes round a centre beam, similar to a wood screw.

In witness whereof, &c.

Specification of the Patent granted to JOHN BROWN, *of the Town and County of Poole, in the County of Dorset; for certain Improvements in the Wheels of Carriages, applicable also to Windlasses, Capstans, and various other useful Purposes.* Dated August 4, 1804.

With a Plate.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said John Brown do hereby declare, that my said

said invention is applicable to the wheels of carriages, to windlasses, and capstans, either on board of ship or on shore, and to the hawseholes of ships, and to other purposes, where the same rotary motion is required, as follows; reference being had to the annexed drawings.

Fig. 1, Plate XV. for wheels of carriages. This is a substitute for the nave, four plates, as A B G H, to each wheel of a carriage. A B, are two metal plates; C, is a metal wheel, with a fixed iron pin. There are six of these wheels put between the plates A B, and their pins *b* move round in the holes in the plates *a a a a a a*. These plates, with the six wheels between them, are kept together by three small bolts, as D, which pass through the holes in the plates *d d d*, and on these bolts are placed stops, as E, which keep the plates separate for the wheels to move round freely. F, is a very thin piece of metal, placed on the axletree, between the wheels and the plates, to prevent water, &c. from getting in. G H, are two smaller plates. I, is a wheel, of which there are six, whose pins move round in the holes in the plates *g g g g g g*. K, is a very thin piece of metal, to keep out dirt and water as before. The larger plates A B, &c. are to be let into the larger end of the nave or stock of the wheel, and the plates G H into the small end, so that the plates may be even with the wood. There must be a small hoop let into the stock, for the edges of the plates to rest on; but when the wood of the nave or stock is not large enough that the plates should be let into the wood, then the thickness of the plates, with the wheels, &c. between them, must be cut off the wood, and a strong broad hoop driven on, and project out so that the plates, &c. may fit into it. The plates are held firmly into the nave by three bolts, as L, which pass through the plates

A B

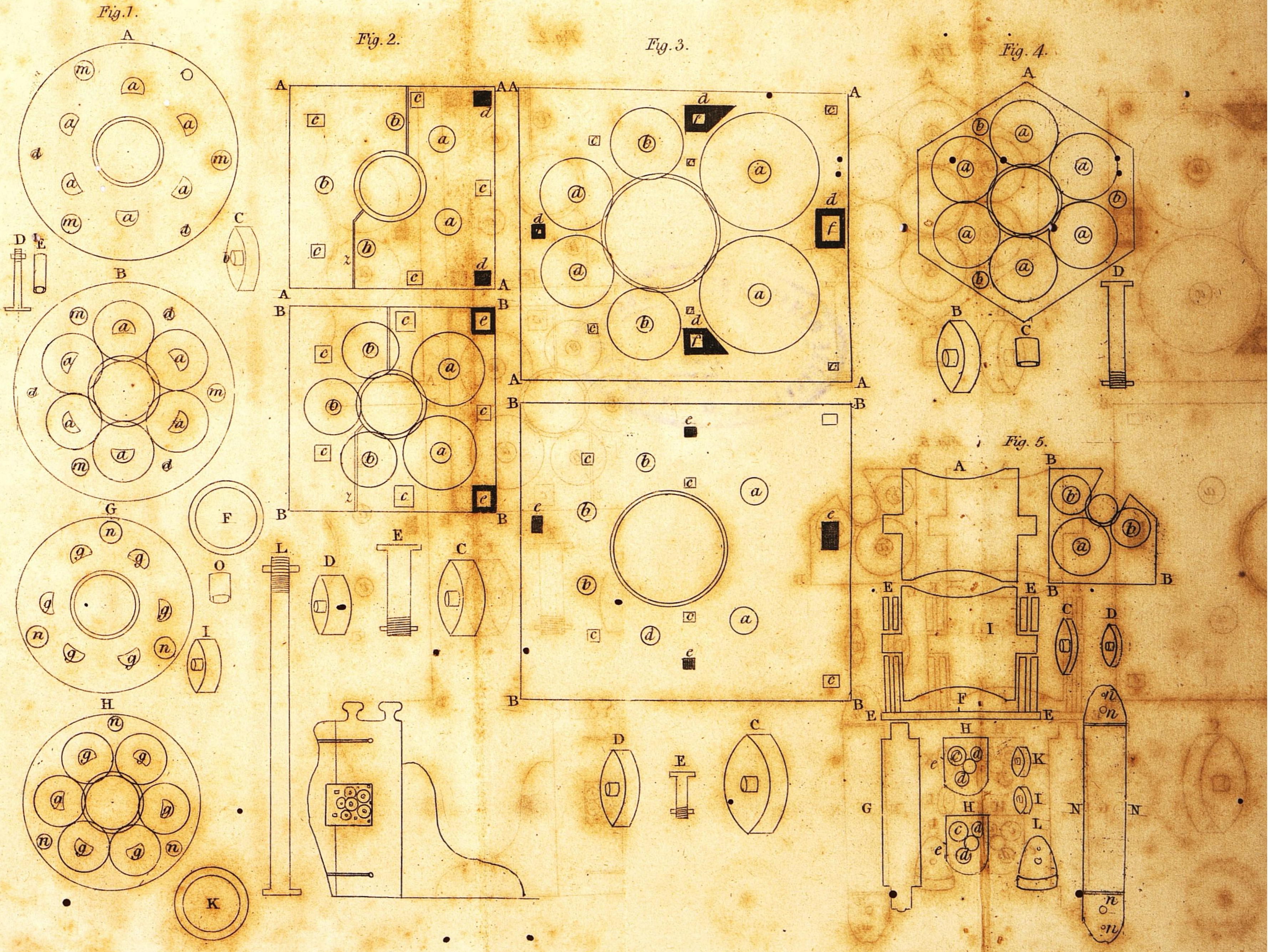


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.

Fig. 1.

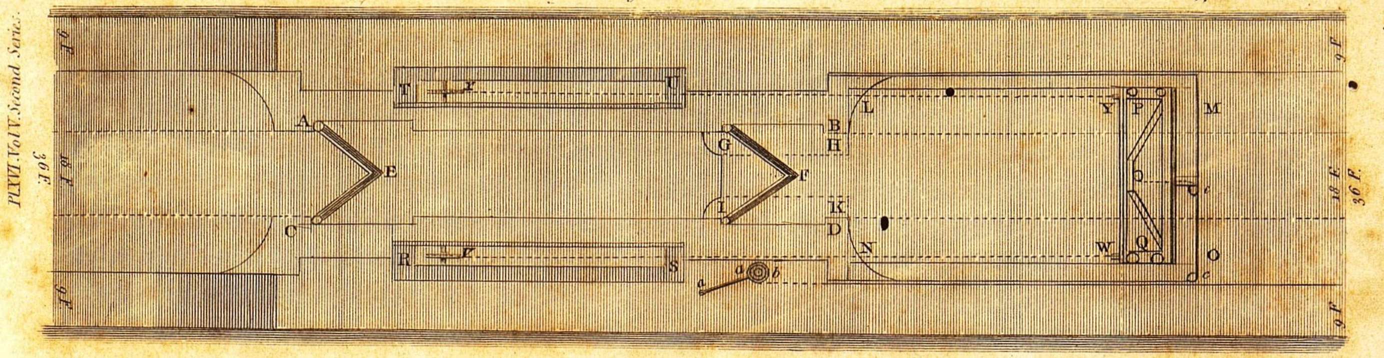
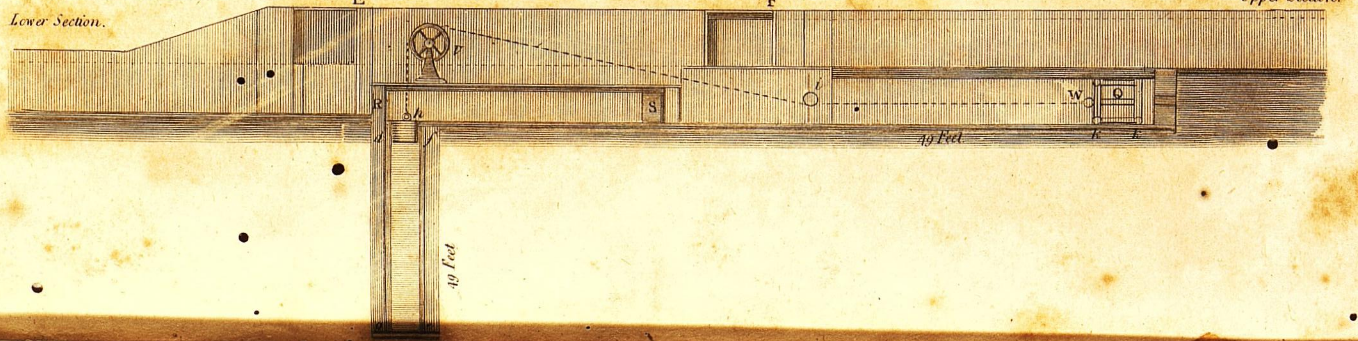

Lower Level.
Upper Level.
9 F
18 F
36 F
A
B
C
D
E
F
G
H
I
K
L
M
N
O
P
Q
R
S
T
U
W
Y

Fig. 2.


Lower Section.
Upper Section.
E
F
R
S
W
Q
V
49 Feet
49 Feet

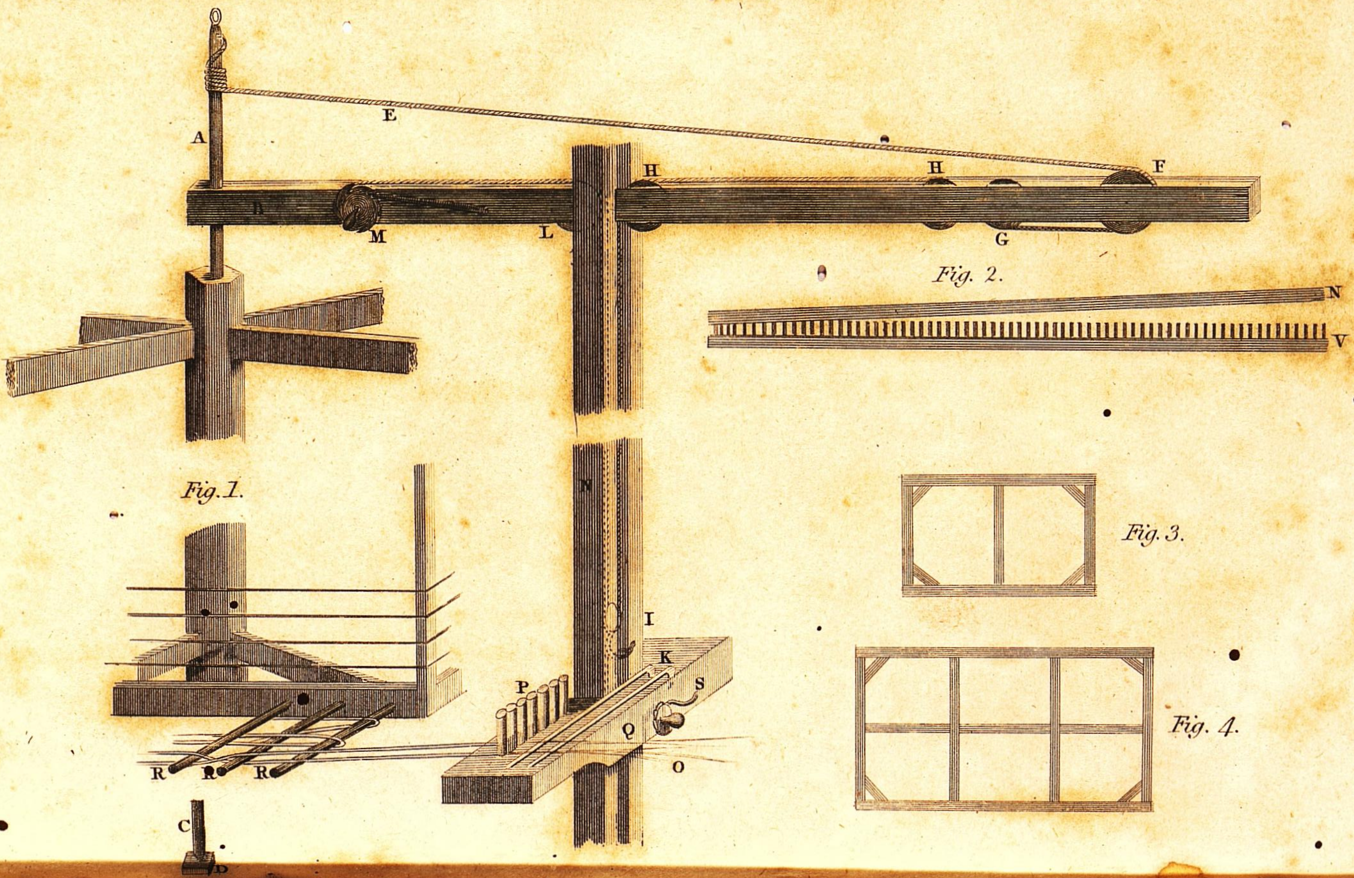


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

A B in the holes *m m m*, and passing through the nave go through the plates G H in the holes *n n n*. On the top of the three bolts, between the plates G H, must be placed three stops, as O, to keep the plates separate, at proper distances, for the wheels to move round freely. On the outside plate, at each end, there must be a thin piece of metal over the holes *a a a a a a*, in the plate A, and over the holes *g g g g g g*, in the plate G, to keep out water, &c. This size in the drawing will suit any small carriage, whose axletree is at the shoulder one inch and a quarter, and at the small end one inch; and when the axletree is larger, the plates, wheels, bolts, &c. must be made proportionably larger and stronger.

Fig. 2, for windlasses. A A A A and B B B B, are two metal or iron plates for a windlass. There are five wheels, with fixed iron pins, between the two plates round the neck of the windlass. The two foremost ones are larger, as C, and their pins move round in the holes *a a*. The plates take in two parts where the white line *z* is marked; the larger part is let into the bits, and the smaller into the cheek, so that the windlass may be taken down when required. The plates are held firmly into the bits and cheek of the windlass by five bolts, as E, which pass through the holes in the plates *c c c c c*. On to the plate A A A A must be cast two pieces, as *d d*, which fit into the holes *e e*, in the plate B B B B, so as to keep the plates true with each other. These plates, if made of cast-iron, must be about one inch and a quarter thick, but if wrought-iron about seven-eighths of an inch thick. This improvement will answer equally well for windlasses used on shore.

Fig. 3, for the capstans of large ships. A A A A and B B B B are two iron or metal plates, between which are placed

placed six wheels round the barrel of the capstan. The two foremost ones are larger, as C, and their pins move round in the holes *a a*. The less four wheels are as D, and their pins move round in the holes *b b b b*. These plates are firmly held into the deck by six bolts E, which pass through the holes *c c c c c c*. On the plate A A A A is to be cast four pieces, as *d d d d*, which project up a little more than the thickness of the wheels; and on the plate B B B B must be cast four pieces of metal, as *e e e e*, to fit into the holes *f f f f*, to keep the plates at equal distance, and true with each other. There must be little vertical wheels, or balls, moving in a groove under the large horizontal wheels, to facilitate their motion. These plates if made of cast-iron must be about two inches thick, but if of wrought-iron one inch and a quarter thick. This improvement will answer equally well for capstans used on shore.

Fig. 4, for small capstans, which ship on a spindle. A, represents a plate of metal, of which there must be two exactly to correspond with each other. Between the two plates are fixed six wheels, as B, whose pins move round in the holes *a a a a a a*. The plates must be let into the foot of the capstan, and firmly held in by three bolts, as D, passing through the holes in the plates *b b b*, and screwing up into three nuts, which must be let into the body of the capstan. Between the welps, on the bolts between the plates, must be placed three stops, as C, to keep the plates separate for the wheels to move round freely. This answers equally well for capstans used on shore. This same apparatus may be applied to the foot of a large barrel capstan, as Fig. 3, by being let into the deck for the foot of the capstan to step into, only in this case the lower plate must have no hole through it.

Fig.

Fig. 5, for the hawse-hole. A, is a metal roller, with a fixed pin. B B B, is a metal plate, of which there must be two to exactly correspond with each other. Between these two plates are to be placed three wheels, one larger as C, and two smaller as D. The pins of the wheel C move round in the holes *a*; and the pins of the wheels D move round in the holes *b b*. E E E E, represent the roller A with the two plates at each end. F, is a flat piece of metal, on which the plates rest. There must be another piece of metal, the length of F, to stand up about two-thirds the height of the plates, to keep the work in the hawse-hole. G, is a metal roller, with a fixed pin. H H, are two metal plates, between which are to be placed three wheels. One layer, as I, whose pins move round in the holes *c*, and two smaller, as K, whose pins move round in the holes *d d*, and the pin of the roller acts on these wheels. There must be two plates, &c. at each end of the roller; but the bottom plate must be without the hole through the centre of it, that the pin may rest on the bottom plate. The two metal plates at each end of the roller must be let into the hawse-piece, outside of the hawse-hole, on the off side, as far as the catch marked in the plates at *e*, the roller standing nearly perpendicular. L, is a metal cap, whose lower part M covers over the two plates with the wheels, &c. and prevents dirt from getting in. N N, represents the roller with the cap at each end; it is held firmly to the ship's bows by two bolts, through each cap in the holes *n n n n*.

In witness whereof, &c.

Observations by the Patentee.

The advantages gained by the use of my improvement for wheels of carriages, capstans, wind and hawse holes of shipping, are,

First. By using this improvement in the wheels of carriages the friction between the box and the axletree is removed, and the same number of horses enabled to draw a considerably heavier weight.

Secondly. By using the improvement for capstans or windlasses, and hawse-holes, a ship will be able to get her anchor when it blows hard, in a strong tide, or heavy sea, with ease and expedition (when compared to the methods now in use); when otherwise, she must sometimes cut the cable, and consequently lose both anchor and cable.

Thirdly. It will at some critical periods, such as riding at an anchor in a heavy gale of wind, near sands, shoals, rocks, &c. and night coming on, be the means of saving the ship and crew, by enabling them to heave short to their anchors, and weather all the danger by being so much more to windward of the rocks, &c. &c.

Fourthly. By using this improvement cables may last double the time, as the motion of the roller in the hawse-hole prevents the sawing of the cable when hove short, and likewise prevents its chafing when riding with a long scope of cable in a heavy gale of wind, strong tide, &c. &c.

Specification

Specification of the Patent granted to MICHAEL LOGAN, *of Paradise-street, in the Parish of Saint Mary, Rotherhithe, in the County of Surrey, Engineer; for a Conservative Lock, for continuing Inland and Canal Navigation with a given Quantity of Water; that is, for preserving the Whole Quantity of Water which at present is expended in the Passage or Passing of all Boats, Vessels, or Craft, through the Locks established in any Line of Inland or Canal Navigation; and for raising great Bodies, or Quantities of Water to any assigned Altitude, for the Purpose of supplying extensive Levels in Canals; and for filling Reservoirs of great Capacity, constructed upon superior or higher Levels, by which the gravitating Power or Force of descending Columns or Sheets of Water can at any given Altitude be obtained and continued for the Use of Water-works, Mill-works, Manufactories, or Systems of Machinery of any Description wanting the Power or gravitating Force of Water for their Motion or Operation.* Dated August 6, 1803.

With a Plate.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said Michael Logan do hereby declare, that the nature of my said invention, and the manner in which the powers of the conservative lock are to be produced, and the effects thereof are to be performed, is particularly described and ascertained by the following principles and plan of operations; that is to say: The principles on which the construction of this lock is formed are these. First, that a light body will put a heavy body, laid upon an horizontal plane, in motion when connected by a line over a pully, the velocity of which is in proportion to the

the absolute weight of the one, and the relative weight of the other. Second, an accelerated or continually increasing resistance, however great, is equipoised by an equally accelerated or continually increasing power; which principle is here to be understood as hydrostatical, and applied to the motion of fluids. Third; when any two fluid bodies, by an uniformly accelerated motion, produce an equilibrium or equilibration, any assigned force, superior to their inertia, supplied to one or to the other, will alternately make them cause or effect, or power or resistance. Having thus precisely stated the universal principles whereon the construction and operations of the conservative lock depend, the plan or disposition of the principal established parts thereof may be taken in any position with respect to the lock itself, which must be according to its situation; consequently I do not here confine myself to any particular delineation of those parts, as the positions of their establishment depend upon local circumstances, whereof and by which the engineer employed in construction must judge and determine. In the plan and sections herewith, rendered as an exemplification, and conformable to the above principles, the established parts of the conservative lock will be found to consist in the system herein described; that is, in the first place must be built a grand recess or reservoir, equal in capacity to contain the whole quantity of water wanted for the lock. This recess is here constructed parallel to the line or course of the canal, and under the bed of the upper level. The floor of the recess, where the canal does not exceed five feet depth of water, may be laid in the same plane with that of the lower level, allowing for strength in construction of the covering whereby the water of the upper level is supported. Under the platform of the upper gates is con-

structed

structed the subterraneous passage of communication between the lock and the recess, through which passage the flux and reflux of the whole body of water wanted for the use of the navigation at each lock are alternately continued and preserved in the operations of the locks. Parallel to each side of the lock are constructed the galleries; the floors of which may also be laid in the plane of the lower level, when their dimensions, or the extent and position of the ground on each side of the canal, will admit it. These galleries contain jointly the whole quantity of water which are here, by construction, the actual and effective power in the operations of the conservative lock. At the extremity of each gallery is sunk and established the shaft or pit which receives and delivers alternately the whole quantity of water from and to the gallery upon the flux and reflux of the lock, or in the ascending or descending of any vessel in her passage through it.

REFERENCE to the PLAN of CONSTRUCTION.

(See Plate XVI.)

A B C D, Fig. 1, the conservative lock, 70 feet in length, 18 feet wide, 14 feet deep, and will contain 17,640 cubic feet, or 490 tons of water, at 36 feet *per* ton. E, the lower gates. F, the upper gates. G, H, I, K, the buttments of the lock, supporting the sill and platform of the upper gates; the sides of which (represented by the dotted lines) form the channel of communication with the reservoir or grand recess of the lock. L M N O, the reservoir or grand recess which receives the water upon the reflux of the lock. This recess may be built either of wood, brick, stone, or cast-iron. P Q, the great gate of the recess, placed upon horizontal and perpendicular rollers. The area of this water-gate

gate must be equal to the entire section of the recess from one end to the other. In front of the gate are fixed the parallel rollers, which move upon the lower and upper planes of the recess, equal in length to the width of the recess. R S, the right gallery, built parallel to the lock walls. T U, the left gallery, built also parallel to the lock walls. These galleries may be built in any convenient form or figure, either of wood, brick, stone, or cast iron. V W X Y, the great tracing chains, which pass over the chain wheels V X. V X, the chain wheels, placed half over the heads of the shafts or pits. *a a*, the capstan and lever, by which the back chain returns the great water-gate in the recess. *b c c*, the back chain brought round the pullies upon the outside of the recess. Note. Where the upper level exceeds the height of seven feet water above the lower level, the floor of the recess must become an inclined plane towards the lock.

REFERENCE to the SECTIONS, Fig. 2.

Note. The letters in the sections, which are the same with those in the plan, are correspondent to the same parts. *d e f g*, the section of the shaft or pit which receives water from the gallery. This shaft or pit must be built either of wood or cast-iron, and equal in depth to the length of the recess. *h*, the plunger, fitted to the size of the shaft, water-tight. *i*, a large pully, fixed into the breast-work of the lock, under which the great chains pass to the chain-wheel. Note. The air-vents are not here shown in the sections. The air-vents are pipes or tubes rising from the bottoms of the shafts to the surface of the earth, in order to prevent a vacuum being formed under the plungers, and also at the back of the water-gate in the recess. *k k*, the rollers, upon which the great water-gate in the recess is moved from one end

to

to the other. These rollers run in cast-iron grooves, constructed in the floor of the recess, by which the gate moves free from friction.

The operative Principles applied in Construction of the Conservative Lock.

First; that the weight of the plungers suspended over the chain-wheels be in equilibrio with the relative weight and friction of the great gate in the recess with the lock-water at its lowest level. Second; the absolute gravity or weight of the two columns of descending water from the galleries is in every point ascending or descending directly as the lateral pressure of the lock-water, at any assigned altitude, upon the plane of the recess-gate. Third; the lateral pressure of the lock-water upon the plane of the recess-gate is directly as the depth of its centre of gravity, or centre of pressure, from the surface, multiplied into the area of the gate itself; consequently the powers and effect of the conservative lock are by its principles infinite, and therefore in practice its dimensions for construction can be taken at pleasure.

By the same principles and plan of operation I do hereby intend to raise large quantities of water to such altitudes as shall render their descent from the reservoirs subservient to the motion of mills and manufactories.

In witness whereof, &c.

Particular Dimensions of this Plan, and Sections of the Conservative Lock.

	Feet.
Length of the lock from the lower to the upper pier head	95
Width of the lock	18

 Depth

	Feet.
Depth of the lock from the surface of the upper level	14
Length of lock on the lower level, or from sill to breast	60
Difference of level from the plane of the platform of the upper gates	7
Length of lock-water on the upper level	70
Length of the grand recess from the breast of the lock to the face of the water-gate	49
Width of the recess from side to side, or length of the water-gate	30
Depth of the recess, or face of the water-gate	6

Flux and reflux of the lock from and to the recess 8,820 cubic feet, or 245 tons of water.

Note. Where the water-gate exceeds 250 square feet in the area, it may be divided into two.

Specification of the Patent granted to Joseph Wilkes, *of Measham, in the County of Derby, Esquire; for a Method of making Paste to be used in weaving and sizing Calicos, and for pasting Paper, and other Things about which Paste is required to be used.*

Dated January 16, 1801.

To all to whom these presents shall come, &c. Now know ye, that the said Joseph Wilkes, in and by this instrument in writing, under his hand and seal, pursuant to, and in compliance with, the terms of the said in part-recited proviso, doth hereby declare that the said invention is described in manner following; that is to say: For making paste to be used in weaving and sizing calico, and for pasting paper, and sundry other things in

in the use of which paste is required, take a quantity of a meally sort of potatoes, according to the quantity of paste required; wash them clean, and without peeling boil them in the best manner, to make them meally when boiled; mash them in a tub or other vessel; then wash clean as many raw potatoes, of a meally sort, as are equal in quantity to the whole of the quantity of the potatoes boiled to mash, and to one third more of that quantity; that is to say, if one bushel and a half of meally potatoes are boiled to mash, then take two bushels of raw potatoes, of a meally sort, and obtain the starch or flour of the raw potatoes by grating them into a tub, or other vessel of water, and by running the water, so impregnated with the grated potatoes, through a sieve or strainer, which retains the coarser and fibrous parts of the potatoes, and admits the finer particles, constituting the starch or flour, to pass with the water into a tub or other vessel beneath the sieve or strainer; which water, containing the starch or flour, should remain in the vessel several hours undisturbed, to permit the starch or flour to subside to the bottom of the vessel; and when the starch or flour is properly settled, pour the water therefrom, and put the starch or flour so obtained into fresh water, and pass it through a finer sieve into another tub or other vessel, and the starch or flour is left to subside to the bottom of the vessel as before, and the water is again poured off. Pour into the mashed potatoes sufficient water to dilute them for the purpose of beating them and passing them through a sieve, and then beat them well; and work or pass them through a sieve or strainer into a copper, boiler, or other vessel, that will bear heat, and when the contents of the vessel have almost boiled, add thereto the starch or flour produced from the grated potatoes, and boil the whole together

 about

about the space of twenty minutes, carefully stirring the same during all the time that it is so boiling; at the end of which time the mixture in the copper, boiler, or other vessel, bearing heat, will be formed into the patent paste. The paste so made should be put into a vessel of large surface, for the purpose of spreading it to cool advantageously. And such vessel may be filled with the said paste to the depth of from four to six inches.

In witness whereof, &c.

Improvements in cultivating Vines; accelerating the ripening of Grapes, and improving their Flavour without the Aid of Fire; Proper Compost for them.

By Mr. RICHARD WESTON, *of Leicester.*

Communicated by the Author.

IN this climate the autumns are frequently so unfavourable, that grapes do not require a sufficient degree of ripeness when planted in the open air against walls, without the aid of fire and glasses to cover them. There is, however, an easy method, which I have practised with success, of accelerating the ripening, and improving their flavour, without the assistance of either fire or glasses.

Of late years it has been the practice to raise vines in pots or tubs to be forced, and many bunches of grapes are produced from a vine in a pot, which contains only four or five gallons of earth.

There are many advantages attending this method. In hot-houses there are frequently vacancies where pots may be placed on the flues or in the tan. In a dung hot-

hot-bed, pots may be plunged into the dung, on the outside, and the branches drawn under the frame, nailed along the back, and kept there till the shoots are a few inches long. Plenty of plants therefore should always be ready in pots to supply such vacancies.

A similar method may be practised between fruit-trees against walls, where there is generally a vacancy of a few feet.

These are the places proper to be adapted for vines, if fronting the south or south-west; but there is one thing particularly to be attended to, which is, to plant only such as ripen early; as

The black and white July grape.

The sweetwater black and white.

The white Muscadine.

The black cluster grape, and some few others.

Method of Layering Vines in Pots.

If you have any vines in your own garden, there is a very expeditious method of layering them so as to have fruit from them in a few months.

Procure some pots, which will contain at least four or five gallons of earth. Unnail some branches which are in a fruit-bearing state, which you can lay in the ground.

Prune the branches properly; draw them through the hole at the bottom of the pot; fill the pots with earth, and place them in the ground.

If there should not be room enough against the walls to train them to, some strong stakes should be put into the ground to which they may be fastened.

During the summer the shoots should be properly attended to, and pruned in the same manner as those against walls.

March

March or April is the proper time for layering them; and during the summer they will have produced sufficient roots, that in October or March they will bear removing.

When you wish to plant them elsewhere, cut off the stalk on the outside of the pot, and they will then be ready for use whenever you have any vacancies to fill up.

By watering the holes well before planting, I have removed such vines at Midsummer, and they have not been injured by the removal.

Method of accelerating the Growth of Vines at Spring.

Having procured some plants properly trained in pots, dig a hole two feet deep: in March or April make a hot-bed, three feet thick, of dung, and in length in proportion to the number of pots you have either against the wall or in some other warm situation.

When the violent steam of the dung is abated, plunge two rows of pots into the bed up to the rim, and spread either rotten tan or earth over them, about four inches thick, to retain the heat.

Place a board, a foot broad at least, at each end of the hot-bed, and another on the top of these. To the top-board, and on the east side, nail a double mat, long enough to reach the ground.

Examine the bed frequently, to try the heat, by keeping a stick in it; and when you find it decline, stir it up, and add more dung, and on frosty nights hang another mat over them.

When you perceive the buds begin to swell, keep the bed up to a good heat, and spread some rotten horse-dung two inches thick, and now and then water it with water or soap-suds, a little warm, and open the mat when the weather is warm, in the middle of the day.

By

By this method of using rotten dung and soap-suds three years ago, an old vine, which was cut down to the ground, and only began to shoot on the first of July, before winter made shoots six feet long.

According as the season proves warm, they will in a few weeks begin to shoot. When the shoots are about six inches long, the pots must be removed, and placed where they are to remain, and trained to the wall as other vines; but it will be prudent to let them be covered at night, until the weather be quite settled.

By following this method, the ripening of the grapes will be accelerated a month or six weeks, and consequently the flavour much improved.

To preserve Grapes till Winter.

About September, when the grapes are nearly ripe, procure some bags made of either crape, muslin, gauze, or white paper.

Select some of the best bunches, and with a pair of sharp narrow-pointed scissars cut off all small unripe, rotten, mouldy, or imperfect grapes, especially those eaten by flies or wasps.

Inclose each bunch in a bag, and tie the bag fast with a string, so that no insect can get into it. In the middle of a fine dry day in October gather them, with a piece of the shoot to them, and hang them up in a dry warm room.

Dip the end of the shoots in melted resin or sealing-wax. Examine them frequently, lest they should get mouldy or rotten.

An

An improved Mode of warping and preparing Webs for Weavers. By Mr. THOMAS BARKER, *of St. Mary-le-bone, London.*

With an Engraving.

From the TRANSACTIONS of the SOCIETY for the Encouragement of ARTS, MANUFACTURES, and COMMERCE.

Ten Guineas were presented to Mr. BARKER *for this Invention.*

THE improved method which I have invented for warping of chains or webs for weavers is a great saving to the master, by laying the work level, and free from slack threads, and saves the labouring weaver one hour in a day. The weavers who have had experience of its great utility for more than twelve months, are ready to testify its advantages. My hearty wish is to make it known generally; and I have no objection to go to any manufacturing town, to teach it perfectly to my brother weavers.

Certificates from Benjamin Thrower, Conly Cassidy, Dennis Brien, and John Henderson, weavers, stated, that they had used, for above twelve months, the warps prepared by Thomas Barker; that they could do the weaving five *per cent.* cheaper when thus warped than in the common way; that it was more free from slack threads, made firmer cloth, and precluded the necessity of cutting the warps at the ends, as has been usually done; and that it saved a considerable portion of yarn to the master.

REFERENCE

REFERENCE to the Engraving of Mr. BARKER'S Method of preparing Webs for the Loom, Plate XVII.

The general object of this method is to lay the yarn or threads evenly upon the warping-mill; and when the warp is transferred from thence to the yarn-beam of the loom, to place the threads regularly upon the beam the whole breadth that the cloth is intended to be when made, so that there may be a proper and equal tension of the threads betwixt the cloth and the yarn-beam. In striped patterns also the figure is thus more distinct, and better managed than it is commonly done.

Fig. 1, Plate XVII, exhibits the upper and lower parts of the warping-mill, detached from each other, in order to shew them of a better size.

A, is the top spindle of the mill, running in a collar, within the upper cross-piece B.

C, the lower spindle or pivot, upon which the mill turns round in a pivot hole, in the lower cross-piece D.

E, a cord wound round the spindle A, passing thence over a pully F, then going under the pully G, and over the pullies H H; thence descending to the pully I, attached to the box K; then ascending to the pully L, and lastly ending at the catch M. The intention of this cord is to give a regular motion to the solid box K, so that the box may slide easily up and down the whole length of the upright piece N, and distribute the threads O evenly upon the mill, as they are drawn from the bobbins. These threads pass, a few together, betwixt each of the small running rollers P, under an iron rod Q, which confines them from rising. After passing the rollers, all the

threads approach each other, and are wound round the mill as it turns upon its pivot.

R R R, three pegs, fixed at the lower part of the mill, upon an horizontal piece of wood, lying betwixt two of the upright staves of the mill. The use of these pegs is to keep small portions of the threads apart, so as to be placed more easily afterwards in the conducting frame. The manner in which these threads are crossed, and returned upon the mill, is shewn at R R R, the pegs being engraved of a larger size than the other parts, to explain their use more clearly.

S, a small-toothed wheel, and catch upon the box, which regulate the distance at which the threads should be laid upon the mill.

M, another small-toothed wheel and catch, fixed on the upper-cross piece or arm B, to tighten the cord which moves the box.

Fig. 2, V, shews the lower part of the conducting-frame, or separater, which has some resemblance to a very coarse comb, with the teeth uppermost. When the warp is removed from the mill to the loom, the small portion of the thread separated by the pegs R R R are placed within each of these teeth; the cap, or upper part of the instrument N, is then put over the teeth, to prevent the threads coming out of it: the whole warp is then drawn through it gradually, as it is wound upon the yarn-beam, and laid very level thereon the breadth that the cloth is intended to be made, rather contracting the breadth, by placing the conductor obliquely, as a greater quantity is wound upon the beam.

Improved Method of constructing Portfolios for the Purpose of preserving Drawings, Engravings, and other Subjects of the Polite Arts. By the late James Malton, *Esq. of Norton-street, London.*

With an Engraving.

From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.

The Thanks of the Society were voted to the Inventor.

THE difficulty, or rather the impossibility of obtaining cases or portfolios, as large as are sometimes requisite, has given rise to many expensive contrivances, to the same end; or large prints, &c. must be kept in rolls, to their almost certain destruction, by frequency of rolling; or at least they are thus exposed to the danger of being crushed by accident. Milled pasteboards, of which portfolios are made, are not manufactured above a certain moderate size: to exceed that size in a portfolio, is an undertaking of no inconsiderable trouble, in pasting, gluing, and pressing them together On inquiring of Mr. Newman, of Soho-square, (a manufacturer of these articles,) how he managed to make portfolios above the ordinary dimensions, he informed me, it was an undertaking of trouble, and related his having made one for a gentleman, by attaching sixteen of the largest milled boards together; that the materials alone cost five guineas; and that its weight was greater than one man could lift.

My method of construction obviates all disadvantages —weight, expense, and trouble; and portfolios of any dimensions may very readily be manufactured by the simple application of two straining-frames, covered on both sides with canvas, and papered; and connected, as

all portfolios are, by leather at the back, or with wooden backs, the sides being connected by hinges. Thus a portfolio may be made capable of holding the largest cartoons, maps, and prints; and possessing another great advantage, besides that of not bellying or swagging, when laid against a wall, as those constructed of pasteboard do, to their own destruction, and material injury of the things they contain.

A frame of four feet by three will be strong enough, if made of deal. The stiles are four inches wide by half an inch thick; and they have a middle upright stile of the width, with angle pieces at the corners, as is shewn in Engraving, Fig. 3. A frame of much greater dimensions may require two middle upright stiles; and, if very large, a middle longitude stile, as is shewn in Engraving Fig. 4.

If the frames are made of mahogany, they need not exceed three-sixteenths of an inch in thickness; but of whatever wood they are made, it must be well seasoned, or they will warp. A padlock may be applied to such cases, for the protection of their contents.

On this construction I have made two portfolios, one of which I have had in use these ten years. A handsome one, of tolerably large dimensions, I have sent with this paper, for the inspection of the Society. The outer stiles of it are of mahogany, which, beaded, forms the out edge in a neat manner. Its simple formation, its lightness, and its firm flatness, must be obvious to every one.

REFERENCE to the Engraving of Mr. MALTON's improved Portfolio, Plate XVII.

Fig. 3, one of the sides of the frame for a portfolio, the dimensions four feet by three: it may be made of deal

deal or fir-wood. The stiles, four inches wide by half an inch thick; the middle upright stile to be of the same width. It should have angle-pieces within the corners, to keep them firm.

Fig. 4, shews a side of another frame, where much larger dimensions are required; it should then have two upright stiles, and a middle longitudinal stile, all within the frame, and angle-pieces at the corners. If it is made of mahogany instead of deal, the stiles may be reduced nearly one-fourth in breadth and thickness; the wood in either case should be well seasoned, that it may not be liable to warp.

On Farm-Yard Compost.

From Hunter's Georgical Essays.

As a farm in most situations chiefly depends on the above for its improvement, no attention should be spared to make the heap as large and as rich as possible. The management of most common farmers is, in this respect, exceedingly deficient; they are ready to sell their hay, straw, stubble, &c. rather than consume them in making dung; and very rarely pay any attention to the preservation of the urine and drainings of their dunghills.

The first of these articles is so important, that without a very determined attention to it, no farm can ever be brought into very high order. All the ensuing management depends upon the quantity of straw and stubble, or litter, being large: but if the farmer sells his straw, how is he to see a great dunghill? The farm-yard manure depends on the consumption of hay and straw; just in proportion as either is sold, the dunghill must decline; and sorry I am to observe, that it is too common a prac-

tice

tice among farmers to be ready to sell both. The rule, however, admits of exceptions; for near very large towns, hay and straw for littering horses will sell for such high prices, that if the farmer's waggon or cart brings him back a load of rich manure, it may be more advantageous to sell than to consume. Profit is the great object, and we must never carry any rules so far as to lessen it; but the common error is doing it too universally, and being tempted with too low prices. To name a price under which a farmer should never sell, is not easy to be done, as it must necessarily be regulated by various circumstances. There are many hay-farmers near London that entirely depend on selling, whatever may happen to be the price: no system of cattle is prepared on such farms to make a profitable consumption of hay, which can only arise from other connected articles. But where such cases do not immediately mark exceptions, I think I may safely say, that a ton of hay, in commonly improved countries, ought never to be sold dry in the winter for less than 50 *s.* nor a ton of straw for less than 30 *s.* with a proviso that they should go at no price without a load of rich manure being brought back. There certainly are farmers who might say, How can I make 50 *s.* by eating my hay at home? All I reply is, that if you cannot do it, you are not in a good cattle system, or you give it lavishly or improperly; and that he who makes a point of doing it will in the long run find his annual dunghill so large, and his fields consequently so improved, that he will assuredly find his account amply in it. It is only by means of such attentions that cultivators have made the surprising quantities we have heard of.

At the most leisure season, before the time of confining his cattle to fodder, so much marl, turf, dry mud, loam, &c.

&c. should be carted into the farm-yard as will cover the whole about twelve inches deep; and if there are many stables, hog-houses, bullock, or cow-stalls, that are cleaned into it, to spread such earth thicker in those places. Those who have the fortunate opportunity of using bog-peat, from the vicinity of a bog or boggy bottom, should not neglect it: such stuff is a vegetable dunghill. Only drenched in water when dry, and carted plentifully into a farm-yard, and littered upon, and impregnated with animal manure, it becomes a most easy and valuable means of adding nobly to the quantity of farm-yard compost.

Before the farmer begins to fodder, which will be probably some time in November, let him litter the whole yard well with either stubble, fern, or leaves. For this purpose I suppose all his wheat-stubbles mown and chopped, and stacked in or very near the yards. If he is near a warren, heath, or common, he may probably be able to procure fern cheap, that is, at the price of eight or ten shillings a waggon-load, in bulk equal to a ton and a half of dry hay: wherever such opportunities exist they ought never to be neglected. In the duchy of Mecklenburgh they are wise enough to know the value of this plant for litter, and reckon the dung that is made of it fatter than that of straw.

If his neighbours will sell their stubble at 12*s.* to 15*s.* a waggon-load delivered in, he ought to provide a large quantity.

Fern, in burning, yields more alkaline salts than any other vegetable, which is proof sufficient how valuable the dung must be; but care must be taken to rot it well, which is more difficult than to rot straw.

No money which a farmer can expend is better laid out than in the purchase of litter of any kind; for his cattle

cattle do not only lie dry, warm, and bedded, but the quantity of manure he raises is very large, and cheaper than in any other way of buying it.

The article of *leaves* depends on his situation. If he is in a wood land, where the trees are thick and spreading, they are to be raked into heaps, and carted to the farm-yard, at a very moderate expense; they make excellent litter, and very good dung. If he has any marshes in his neighbourhood that afford a good swarth of rushes, coarse grass, flags, &c. &c. he should not neglect to lay in good store of them for the same use; and if he has the power of cutting the aquatics that rise under water in lakes or meres, or flooded grounds, he may do it by jointed scythes, and rake them into boats. I have rowed through acres of water, in Ireland, in Loch Erne, so full of these, that the quantity of litter they would yield is prodigious.

These steps being taken, the farmer is well prepared to meet the winter, and to turn it greatly to his advantage; but, in order to do this, he must adopt that husbandry which this climate points out as necessary, but which those commonly esteemed more happy are exempted from, and consequently tempt farmers to neglect this necessary business of making dung. The management I mean, is the strict confinement of his cattle during winter. Some curious cattle-masters tie them up in stalls; I do not require it; but it is essential that they are confined to the yard, and on no account suffered to roam about any pastures, which is a practice too common. If all the catttle of a farm are absolutely confined to the yard, the lean stock to straw, and the rest to straw and turnips, &c. or to hay, the compost of marl, litter, and waste straw, will have the necessary quantity of animal

mal manure amongst it to ferment, rot, and turn to rich manure; whereas if the cattle do not live entirely in the farm-yard, the heap may be large, but of little value; a difference I have had repeated occasion not only to observe, but to experience in taking dung at a valuation from *quantity*, when the quality (owing to this circumstance) was of little worth. The benefit to the cattle of wandering is much less than is supposed by some; and the mischief to the grass lands, except on the lightest soils, very great.

In this system there must always be a pond's mouth in every yard.

The common error, to be seen in the management of half the yards in the kingdom, is suffering the drainings to run to waste. Rain and snow will, in spite of any management, sometimes overflow; but in general the whole may be under command. The best method is to sink a well about five feet deep, in the lowest corner of the yard, to fix a pump in it, and to raise a small stage whereon to stand and work it; a trough will then convey the water to a large heap of marl, chalk, turf, loam, &c. and daily pumping over it will make it of little less value than a heap of dung of the same size. The whole expense of what is necessary for this will be under four pounds; and that of pumping is too trifling to think of. The dung should never be suffered to remain under water, however rich it may be; as putrefaction is in that case stopped.

At the end of the foddering season, the farmer is to turn over, and mix very well together, the compost which the winter management has given him. This is necessary, that the dung and earth may be well incorporated.

Thus the dung is ready for turnips and cabbages; if kept longer for beans to be carried on in autumn, or for potatoes in the following spring, in which case it must, on wet land, be carted in a frost. And here results the convenience of having a variety of farm-yards; that is, one on each side of a barn; for if the dung is not carted for turnips or cabbages, it must be moved to a heap, as the foddering of the ensuing winter will begin before it can be taken for the other crops. This carting to form a heap is equivalent to a stirring, and I would not have the heap touched after the first mixing together of the marl and the layer, which has accumulated upon it. Many persons turn over their dunghills frequently, in order that they may rot the sooner; but I have often observed, that no dung becomes so thoroughly and equally converted into a mucilaginous mass — into black butter, as the farmers call it — as that which never was stirred at all. By moving, the dung is made to lie loose and hollow; every fresh fermentation that is excited in that state volatilizes the oil and alkaline salt, and carries it off to the atmosphere: hence we see that a dunghill often stirred or moved, though black and rotten, is by far drier than one which has remained untouched; and it is the fat, oily, wet rottenness that is valuable, that is mucilaginous. The longer you keep, and the oftener you mix your dung, the drier it becomes; till at last it has the appearance of black snuff, and might be sown by hand. Hence, therefore, to avoid too much stirring and moving (which by the way is very expensive also), I would let it rest in the farm-yard till the land is ready it is designed for, and fodder in another yard. If the buildings and conveniences will not allow this, then in the spring, as soon as the foddering is over, I would, instead

stead of turning over, cart it at once out of the yard into a heap, taking care to mix the marl with the litter as well as possible in filling the carts; and making the heap in the field where it is to be used, leave it untouched; in which way the dung has but one stirring also. The heap should not be above four feet thick, and not carted on to; and if it is put in a shady place, under thick-spreading trees, so much the better.

Here you will permit me to reprobate a very common and mischievous practice; it is that of keeping hogs in the yard, who, for ever burying themselves in the straw, disturb its fermentation so much, that the putrefaction, so necessary to bring it to a mucilaginous state, can never go on as it ought. These animals are not content with the fresh straw just thrown out of the barn, but dig into and disturb the mass that is trodden down, and which ought to rest, in order to ferment. One can scarcely go into a farm-yard without observing this ill management; the food thus procured for the hogs is of no value comparable to the mischief they do; at the end of the foddering-season, the litter of the yard is in so uncorrupted a state, that it must be carted on a fresh heap in order to rot; whereas a dunghill made in any place where the hogs cannot get at it, will often be ready to carry on the land. I have heard the practice defended, as there is no folly but will meet its patron; but let me ask these people, would they have the mass of litter in the yard ferment and putrefy, or would they not? And does grubbing into, and disturbing it daily, retard or accelerate the fermentation?

If a yard was kept warm by covering it with a roof to keep out rain and frost, admitting air around it, the litter would putrefy the sooner. How ill-judged, therefore, to let the cold air, frost, and snow, into the mass

 itself,

itself, by the holes these grubbing animals are constantly making! The hogs should be confined to their own small yard.

Respecting the quantity to be used *per* acre, it depends on three circumstances. The richness of the compost — the soil — and the crop. — If many beasts or hogs were fattened in the winter, it will be much richer than if made by only lean cattle, when more must be used. — If the soil is very poor, it will demand the more; and potatoes or cabbages will require a larger manuring than other crops. However, in a general way, forty tons may be reckoned a proper manuring, if the compost is not very rich; if it is, thirty.

A very different system from this has been practised and recommended by some persons; which is, to neglect littering altogether — to keep all cattle tied up — and to make them eat all the straw. This is done by means of particular standings or floors, that have a step immediately beyond their hind-feet; so that neither their dung nor urine falls on the part where they lie, in which manner mere sweeping keeps them clean. This may be the most profitable in certain circumstances, particularly where straw cannot be purchased, and on farms that contain much grass and but little tillage.

Before I quit this subject of managing the farm-yard dung, I shall mention a speculation which I believe I shall put in practice, as soon as it suits my convenience. It is to cover the entire farm-yard with a slight roof of feather-edged boards; the expense is not considerable. I have little doubt of its answering greatly. Very heavy rains and snows that float the yard by accident are bad enough, but not so much to be guarded against as the sun, and especially upon the system of soiling in the summer, or a part of it, all the cattle on the winter's

dung.

dung. No man that has not tried it can easily conceive the difference between the dung that is made under cover and that which is exposed to all weathers. The superiority is indeed so great, that I believe one load to which neither the sun nor rain can come, is worth two exposed to both. It rots much better and quicker also.

I should apprehend the yard-cattle also would be in better condition, when covered from the weather, than when exposed to beating rains; but the whole side to the south should be open about nine feet high, in order that they should have plenty of air.

Of the Manner of preparing China Soy.

By Michael von Grubbens.

From the Memoirs of the Academy of Sciences of Stockholm.

THE Transactions of the Academy of Sciences for the year 1764 contain a description, by the late Captain Ekeberg, of the preparation of China soy; but as that description is not only incomplete, but even inaccurate, (for by following it the genuine China soy cannot be obtained), I am persuaded that M. Ekeberg never saw, nor was acquainted with, the method employed for preparing it. I presume that he gave this description from the accounts of the Chinese, which are not always to be depended on, as I found, by experience, in the five years of my residence among them, when I wished to make myself acquainted with their method of managing a kind of silk-worm, which spins five or six times a year, of dying

ing cotton and silk, and with several other branches of Chinese œconomy.

Having since, at a dear rate, acquired accurate information on these subjects, I have seen how widely their accounts differ from the truth. I experienced the same thing when I wanted to learn their method of making soy; but having at length obtained a perfect knowledge of the process, I think it my duty to communicate it to the Academy.

Soy is made of a species of kidney-beans (which are white, and much smaller than those of Turkey,) wheaten flour, common salt, and water, in the following proportions: 50 pounds of kidney-beans, 50 pounds of salt, 60 pounds of flour, and 250 pounds of water.

After the kidney-beans have been well washed, they are boiled in an open pot, in spring water, several hours, or till they become sufficiently soft to be mashed between the fingers. During the whole time they are boiling, they ought to be covered with water, that they may not be burned. Care should be taken not to boil them too much, as too great a portion of the substance would be left in the liquor. When the kidney-beans are boiled in this manner, they are taken out, and put into large low wooden vessels, or, according to the Chinese method, into tubs made of split bamboo, two inches and a half deep, and five feet in diameter. In these they are spread to the thickness of about two inches. When they are cool enough to be stirred with the hand, flour is gradually sprinkled over them, and well mixed with the kidney-beans; and this is continued till the whole of the flour is used. When the mass becomes too dry, and the flour does not blend with the kidney-beans, a small quantity of the hot liquor may be added.

The

The whole being well mixed, the mass is spread in the above-mentioned vessels, taking care that it may not lie in cakes more than an inch, or an inch and a half thick; after which, put over them covers that fit exactly. When you perceive that the mixture begins to grow mouldy, and that heat is disengaged from it, which takes place in two or three days, the cover may be lifted up, and supported by two sticks, in order to give the air free admission. During this time a rank smell is exhaled: if the mixture assume a green colour, it is a sign that all goes right; but if you observe that it begins to grow black, raise the cover still higher, that the mixture may come still more in contact with the air. If the mixture once become black it is entirely spoiled.

When you perceive that the whole mass is green and mouldy, which commonly happens in eight or ten days, remove the cover, and expose the mixture several days to the air and sun.

When the whole mass has become as hard as stone, cut it into small pieces, and throw them into a large earthen pitcher; add 250 pounds of water, in which the 50 pounds of salt have been dissolved; stir the whole well together, and take notice how high the water reaches in the pitcher. In case one pitcher is not sufficient, divide the mass into several, always observing that each should be proportioned to the quantity of matter put into it.

The pitcher being thus filled, place it in the sun; the contents should be stirred and shaken regularly each morning and evening. Take care to put a cover over the pitcher every evening, to secure the mass from the cold. This cover should be made convex above, that rain may run off with the more facility. It must likewise be put on if it should happen to rain in the daytime.

The

The greater the heat of the sun is, the sooner the preparation of the soy is finished. This operation is, in general, undertaken only during the summer, and yet it requires two or three months.

In proportion as the mass diminishes by evaporation, add spring water to it; continue this process till the salt water has entirely dissolved both the flour and the kidney-beans; then leave the pitcher a few days longer in the sun, that the dissolution may be the more complete, as on that circumstance the quality of the soy always depends. During this time you ought not to neglect to shake it every day.

When you find that the mass has become very succulent and oily, pour out the whole into bags, from which, by pressure, you extract the soy, which is then clear, and ready for use. It must not be boiled afterwards, as M. Ekeberg asserts, but must be put into bottles, which should be carefully corked. The Chinese use large stone bottles for this purpose. Before it is pressed the soy is of a dark brown colour, but it then becomes black.

With the pulp which remains, the Chinese make two other kinds of soy; the first time they add 150 pounds of water and 30 pounds of salt, and after pressing the mass, they again pour to it 100 pounds of water and 20 pounds of salt, constantly proceeding in the manner described above.

The two latter are not strong, but very salt, particularly that last extracted; the colour of which likewise is much lighter. These two kinds are the most common in China, and are used both by the Chinese and Europeans: the difference between them is as 8 : 4 : 1.

In this manner I prepared, in 1759, at my residence in Canton, all the soy that I used there; I even brought with me a few bottles to Sweden; it was succulent, oily, pretty

pretty salt, and quite different from that commonly sold in Europe. In taste it was equal to that of Japan, which is generally considered to be the best.

The accuracy of this description may be the more re-relied on, as I always prepared my soy myself; I even venture to assert, that there is no other process for obtaining soy of the best quality.

M. Ekeberg says, that the soy is boiled, and that sugar, ginger, and other spices are added to it; but this cannot be the case, since a pound of soy costs no more than two *canderins*, Chinese money, (about three-pence halfpenny English). This was the ordinary price during the whole time of my residence in China; so that it cannot be supposed that those ingredients are employed in its preparation. Besides this, soy has no taste of sugar or spices, but that of salt predominates in it.

Second Memoir on Crude Platina; or first Series of Inquiries upon the new Metal contained in Crude Platina.

By Messrs. FOURCROY *and* VAUQUELIN.

From the ANNALES DE CHIMIE.

IN our first memoir * we said, that the black powder, which remains after the solution of the platina in nitro-muriatic acid, contained iron, chromium, and a new metal; and that the latter appeared to us to exist in it in the metallic state.

It has been seen that this powder, almost unattackable by the most powerful acids, and resisting even to a certain degree the nitro-muriatic acid, was attacked only by fusion with potash, and that this kind of treatment dis-

* Published in the preceding numbers of the present volume of this work.

covered to us the presence of chromium in this powder. After having fused the black powder of the platina with three parts of potash, we observed that it assumed a yellowish-green colour; that the alkali dissolved in the water acquired from it an orange-yellow; that the acids precipitated from it flakes of a deep bottle-green. We afterwards treated, by the muriatic acid, the matter deprived of alkali, by means of repeated washings, and we obtained a solution of a deep green, which passed into a vivid red by the heat of ebullition. We have also remarked in the preceding memoir, that this solution, which had become red by the action of heat, was immediately discoloured by the addition of sulphate of iron, and gradually returned to its original green tinge; that even at the end of some days it deposited a black powder, insoluble in the acids. We have also shewn that this red solution, mixed with a solution of pure platina, gave it the property of forming a red precipitate by sal ammoniac, a property which it did not possess when it was green. Finally, we announced that till the black powder was entirely dissolved and decomposed, the potash with which it was treated assumed at each operation a yellow colour, the intensity of which indeed diminished progressively; but that the muriatic acid acquired by the last operations, and by the addition of water, a more pure blue colour. We at the same time perceived that the first solutions, by the muriatic acid, contained a considerable quantity of iron, and that the last were almost exempt from it. Hence we concluded, that the black residuum of the platina was principally composed of chromium, of iron, and of a new metal.

Since that period we have instituted new inquiries, the result of which we are about to make known in this second memoir.

A. In

A. In the first place, experience taught us that, in order to decompose the black powder of the platina, it is better to employ an equal part of potash than the three parts which we had taken in our first operations, because the matter assuming then only a paste-like fusion, the black powder cannot be precipitated, and presents a much more extensive surface to the potash and to the air. Thus instead of five or six successive treatments to which we were obliged to subject the black powder, in order entirely to decompose it, two, or at most three, successive treatments, with an equal quantity of potash, were sufficient to effect its entire decomposition.

B. After having treated thirty-three grammes of black powder three times successively and alternately with potash and muriatic acid, there remained only about three grammes of small metallic grains, of a white colour, and brittle, which we took in our first experiments for platina, but which are not really such; for, though sufficiently divided, they were not dissolved by more than three hundred parts of nitro-muriatic acid boiled upon them for a long time. The acid had acquired by this operation only a slight red colour, inclining a little to the rose, and it left, after evaporation, only a light residuum of a beautiful blue.

If this substance had been platina, it could not have failed to dissolve in the nitro-muriatic acid, and its solution would not have become blue by evaporation. These grains appear to us to be nothing more than our new metal, free from all combination.

C. In lixiviating the matter every time that it had been treated by the potash, we perceived that there exhaled from it a vapour, which, though invisible, had a very strong action upon the eyes and upon the throat; it gave them the impression of an insupportable acrimony and con-

constriction, which had some analogy with that which we experience from horse-raddish or oxygenated muriatic acid.

In order to see whether we could find the cause of this singular odour, we collected all our alkaline leys, proceeding from the complete decomposition of the thirty-three grammes of black powder, and we subjected them to distillation in a retort of glass, provided with a recipient immersed in cold water. We divided the product into three nearly equal parts, which presented to us the following properties.

1. These liquors being distilled, they had the same odour as before, but they were much stronger in the first, and infinitely weaker in the last.

2. The cork-stoppers, with which the bottles that contained these liquors were closed, had acquired a blue colour, of so deep a cast that it appeared black.

3. A drop of the first liquor which had fallen accidentally upon the hand, formed upon it a deep brown spot, which the acids and alkalies could not remove.

4. These liquors had an extremely pungent and styptic taste, leaving in the mouth an after-impression, nearly similar to that which is produced in it by a solution of silver.

5. As the vapour which is disengaged from these distilled waters had blackened the cork-stoppers, we mixed with them some drops of alcoholic infusion of galls, and immediately the liquor assumed a superb blue colour: characters drawn with this liquor upon paper are blue, but when they dry they appear black; neither the alkalies nor the acids efface them; the muriatic turns them green without removing them.

6. The infusion of gall-nuts having produced in this liquor nearly the same effect as upon a solution of iron,

we

we poured into it a little prussiate of potash, but no precipitate was formed; only the liquor assumed a red colour, which the addition of nitric acid changed into a violet.

7. A plate of zinc put into this liquid, to which a little muriatic acid had been added, gave it at first a purple colour, which soon passed into a pure blue, and which at last was entirely destroyed, whilst there was gradually deposited a considerable quantity of black flakes, which the acids did not dissolve.

8. A solution of green sulphate of iron caused this liquor to assume a purple colour, afterwards a blue, and at last a black one.

9. Sulphurated hydrogen produced the same phenomena as the sulphate of iron. In all these mixtures, in which the matter contained in the liquor passed into the blue or the black, the odour was entirely destroyed in a very short time.

10. Wishing to know whether these liquors did not contain potash, and whether this alkali was not the cause of a part of the properties which we have just mentioned, we mixed some of it with syrup of violets; but this was in no wise turned green by it, it only lost all its colour in a few moments; however, the liquor again acquired a violet-red colour after some days.

11. We applied the same test with the tincture of turnsole, which was not reddened by it.

12. Finally, we remarked that a coarse wet cloth, with which we had surrounded the recipient, in order to cool it, and cause the vapours which passed during the distillation to condense more quickly, was considerably blackened by the vapours which had not had time to be reduced to the state of vapour.

According

According to these phenomena, we could not doubt that the substance which produced them was the new metal contained in the platina.

D. We presume that it will be an object of no inconsiderable interest to chemists, to see a metal, very difficult of fusion, the least soluble in the acids, and the least oxydable of all, dissolve thus in water, and also become volatilized with facility. It is certainly a very extraordinary fact, of which chemistry has not yet afforded an example, at least with respect to metals, and which merits all the attention of the learned.

What is remarkable here is, that the solution of this metal in water distilled with its oxyde has no colour, whilst its combination with potash has a very marked red tinge, which seems to indicate that it is then in a particular state of oxydation. The following fact seems to us to afford a confirmation of this idea. Nitric acid, poured into the solution of potash with which the black powder has been calcined, causes it to lose all its colour, renders it turbid, and precipitates from it flakes of a red-brown colour, causing the liquor to assume a lemon-yellow cast.

This liquor, filtrated and separated from the oxyde of the metal, subjected to distillation, furnishes products entirely similar to those which we have obtained from the alkaline solution not mixed with the nitric acid; and the latter, having been exhausted of the odorous and volatile part by distillation, gives still as much precipitate, by means of the acids, as if it had not been heated.

Hence it appears evident to us, that the metal exists in this alkaline solution in two different states; in the one it is volatile, not colouring and not precipitable by the acids; in the other state it has opposite properties.

E. The

E. The oxyde of the new metal, which dissolves in potash, and which is precipitated from it by the acids, has a red colour of a violet and sometimes a little greenish cast, as long as it is moist; but when it dries, especially in the light, it passes into a blue and even into a black. This oxyde always contains a little silex, on account of the sand which exists in the residuum of the platina, which the potash dissolves, and which is precipitated with the metallic oxyde by the addition of the acids.

After having dried a portion of this oxyde, we dissolved it in muriatic acid, in order to separate the silex from it, but having perceived, as we heated the mixture, that there was disengaged from it an odour similar to that of which we have spoken above, with this difference, that it was mixed with that of muriatic acid, we put the solution into a retort, and distilled it to dryness with a gentle heat. When we afterwards examined the product of the distillation, we found in this muriatic acid the same substance as that which had been afforded us by the distilled alkaline ley, at least it presented, with the re-agents mentioned above, similar effects. This oxyde has therefore also the property of becoming volatilized with the muriatic acid: however, it was not entirely volatilized; there still remained in the retort much of it which was combined with the muriatic acid; for, when water was added to it, the greater part dissolved in it, and formed a liquor of a superb red colour.

Hence it is very probable that whenever we evaporate, especially with a brisk heat, the muriatic solution of this metal, we lose much of it; and this is what we had already perceived in preceding experiments.

TO BE CONCLUDED IN OUR NEXT.

Observations on Bleaching with Vapour.

Communicated to the Society for the Encouragement of National Industry by M. Bosc.

From the Annales des Arts et Manufactures.

Since Berthollet discovered that, by the use of oxygenated muriatic acid, in the bleaching of thread and stuffs, the practice of exposing them for a considerable time in the fields might be dispensed with, there are few arts which have afforded so much exercise to the sagacity of men of science and artists. This valuable discovery was still, however, imperfect; the use of oxygenated liquors is but accessary in the process of bleaching, and they would even be of little or no benefit without the employment of alkaline leys. It was, therefore, highly necessary to endeavour to give the leys the utmost degree of perfection, and no person had yet attained that point. Chaptal, to whom the arts are indebted for so many profitable lessons and useful discoveries, rendered that service to the art which is the subject of these observations, by drawing from obscurity the unskilful practice of ignorant workmen, and by developing the numerous aplications of which it was susceptible. The action of the double combination of alkali, and of the high temperature of the vapour of water in close vessels, is so powerful in destroying the colouring part in linen cloth, its employment is so convenient, and attended with so little expense, since those complicated apparatus with which it was unnecessarily encumbered have been exploded, it may be applied with such advantage to all the known processes of bleaching, that I doubt not but that in

in a few years it will be generally adopted in every bleaching establishment.

I have with great attention followed the progress of the new art of bleaching with vapour; I have carefully studied its phenomena, and I think that the members of the Society will be inclined to grant my observations a favourable reception. But as theoretic ideas ought to be founded on facts, before I state my opinions, I think it indispensably necessary to present the result of the operations on which they are grounded.

In the city of Troyes, where various kinds of linen, and great quantities of hosiery, are manufactured, there are several establishments for bleaching both by vapour, by oxygenated muriatic acid, and by the old method of exposure in the fields.

The establishment of which I am about to speak is the most considerable of those which employ the process of bleaching by vapour. In the space of between eight and nine months it has bleached nearly twenty thousand dozen of hosiery, weighing upwards of sixty thousand pounds, and between two and three hundred pieces of linen. It is not, therefore, of an experiment of the laboratory (always illusive, and frequently uncertain) that I am going to give you an account, but of the labours of a manufactory in a regular course of trade.

I shall first present you a statement of the different manipulations employed according to the methods used for bleaching hosiery at Troyes. This statement will be useful, as the subsequent observations tend only to prove and develope it.

Ex-

Exposure in the Fields.	*Oxygenated Muriatic Acid.*	*Vapour.*
One boiling with soft soap or soap of potash.	One boiling with soft soap; two or three leys, according to the quality and fineness of the goods.	One boiling in soft soap; one immersion in oxygenated liquor.
Seven liquid leys, and the same number of exposures of six or eight days each, in the fields.	Two or three immersions in oxygenated liquors. One acid bath.	One vapour-ley.
		One acid bath, or in a liquor slightly oxygenated.
In all fifteen or sixteen operations, which require from seventy to eighty days.	In all seven or eight operations, which require fifteen or sixteen days.	In all four operations, which require from ten to twelve days.
Price of bleaching one franc *per* dozen.	Price 1 franc 20 cent. *per* dozen.	Price 1 franc *per* dozen.

By

By this comparison it appears, that the advantage is in favour of bleaching with vapour, both with respect to expedition and price. I shall add, that for bleaching in the fields a great space is necessary, as each pair of stockings must be extended on the grass, and turned every three or four days. For bleaching by vapour very little room is required; and the manufactory, of which I am speaking, is situated in the centre of the town. The process of bleaching in the fields can be performed only in summer, it would be in vain to attempt it when the dews are not abundant, and the weather serene; on the contrary, the bleaching by vapour may proceed in all seasons, except during sharp frosts. In short, it must be admitted that Chaptal's discovery completes Berthollet's; for if the liquid leys were as active as those with vapour, only one would be necessary, and the immersions in oxygenated liquor, which render the process complicated, and increase the labour, might be avoided.

FIRST OPERATION.

Boiling with Soft Soap, or Soap of Potash.

Stockings and caps, upon leaving the hands of the maker, are soiled with black bars, which withstand leys and oxygenated muriatic acid. It is a kind of grease which nothing but a strong solution of soap is capable of entirely removing. It is the custom of the trade to employ soft soap in the proportion of one-fifteenth of the weight of the articles to be bleached, which is very expensive. This quantity I have diminished, and instead of pure water, which was employed for dissolving the soap, I have introduced a weak solution of caustic soda. Thus to the good effects of the soap is united the advantage of having a preparatory ley, which perfectly cleanses the cotton, and disposes it for the succeeding operations.

 After

After the boiling, the hosiery should be beaten in the water, in order to disengage the dirt from it, and it ought to be washed with great care, its colour depending on the perfection of that operation. If time permit, it should be dried in the air *.

SECOND OPERATION.

Immersion in Oxygenated Liquor.

It is indifferent in what manner the oxygenated liquor is prepared. At Troyes the bleachers use oxygenated muriate of potash; some prefer bleaching-salt, which is more active and more economical. The bath has no occasion to be very strong: the design of this operation is to oxydate the colouring part, and to dissolve it, the better to receive the impression of the vapour-ley. After seven or eight hours immersion in the bath of oxygenated liquor, the goods are taken out, washed with care, and dried if possible.

THIRD OPERATION.

Vapour-Ley.

The vapour-chamber is a square tower, strongly built of free-stone. This tower rests upon the edges of a copper boiler, which occupies its base. This boiler is from fifteen to eighteen inches in depth. On its rim, which projects internally five or six inches, is fixed a strong wooden grating, put together without nails or iron,

* It cannot be too strongly recommended to endeavour to bring to perfection, in bleaching establishments, the method of beating and washing linen cloth, either by means of machines or manual labour: the purity of the colour, and the success of the operation, depend, in a great measure, on the care that is taken to wash thoroughly, in clean water, the articles that are to be bleached. This is the reason why goods bleached in winter are never of a fine and brilliant white.

Above

Above the grating, and at intervals of six inches, lodgments are made on two of the parallel sides, up to the top of the tower, for placing frames, intended to support the beds of hosiery, successively raised one above the other. The tower is covered by a dome; in the centre of which is made an aperture eighteen inches in diameter, that may be closed at pleasure, by means of a stone which exactly fits it. There is no other issue for the vapour but by a small aperture, six or eight lines in diameter, which is furnished with a safety-valve. This chamber is capable of containing three hundred dozen of hosiery, weighing rather more than nine hundred pounds.

The hosiery is prepared by strongly impregnating it with a caustic solution, marking from one to two degrees on Moissy's areometer. It is placed in the chamber on frames, provided with a net-work of cord sufficiently strong to bear beds five or six inches in depth, beginning with the lowermost beds, which must be watered with fresh ley as you proceed. When the chamber is filled to the top, it is closed hermetically, a fire is kindled under the boiler, and care is taken to keep it in continual ebullition for three hours. The chamber is then opened, the hosiery is wetted with fresh ley, previously made hot; the chamber is again closed, and the ebullition repeated for three more hours, observing the precaution, to draw from the boiler a quantity of old ley equal to that poured through the aperture at the top, otherwise the boiler would be too full and run over, which would injure the bed of hosiery that rests on the grating and the lowermost frames. This operation is repeated at the above-mentioned interval during twenty-four or thirty hours, taking care alternately to subject the goods to the effect of the vapour at a high temperature and under a powerful

powerful pressure, and to water them with fresh alkaline liquors. After this operation the stockings and caps are perfectly scowered, and quite white; they are washed with care, and afterwards dried.

FOURTH and last OPERATION.

Acid-Bath.

Upon leaving the chamber, the goods are, as I have already observed, of a pure white, but not sufficiently brilliant. To give them, therefore, vivacity and lustre, the labour of bleaching is terminated with an immersion in water slightly acidulated by means of sulphuric acid. This operation, however, requires great caution, for if attention be not paid to wash, with great care, all the articles that have been subjected to it, they will infallibly be spoiled. On this account bleachers employ in its stead a slight immersion in water oxygenated with oxygenated muriate of potash. The goods are then carefully washed in very clean water, and dried in the sun; after which there is nothing more to be done but to look them over, and put them in paper. This white is very beautiful and lasting; I have examined articles which, after lying a year in the shop, had not become in the least yellow; which is very rare when the process with oxygenated muriatic acid is employed.

It is easy to perceive that all the success of this business depends on the precaution taken to alternate the effect of the vapour with the action of the caustic alkali, which is renewed every three hours. Our colleague Bardel has contrived an ingenious machine, by means of which the effect of the vapour and of the watering may be rendered alternate. But as the waterings cannot be regulated at pleasure, and the construction of the boiler requires greater attention than ordinary bleachers are capable

pable of taking, I shall give an account of a method still more simple, and not less efficacious.

Take a tub made of deal, with thick sides; six or eight inches from the bottom fix a grating of white deal, joined together without nails or iron: to this tub adjust a lid of deal planks, grooved, and held together by strong oak bars. This lid must be made to fit the tub as exactly as possible. Then procure a small copper pot, to which solder a cover, terminating in the form of a beak. These are all the instruments necessary for bleaching; so that they are neither expensive nor of difficult construction. The operation is performed in the following manner. My experiments were made on several pieces of the coarsest cloths of hemp and flax, and on stuffs, thread, and cotton called *Cannelés de Rouen*, which are very difficult to be bleached, because their texture is extremely close.

Introduce the beak of the pot, which must first be placed on a furnace between the two bottoms of the tub, and lute it carefully. Fill the pot about two-thirds with water, by a hole made in the lid, which must then be closed with precaution: upon the grating, which forms the false bottom of the tub, place the cloths previously impregnated with caustic alkaline ley, and water them as you proceed with fresh ley. When the tub is filled within six or eight inches of the top, put on the lid, taking care to stop the crevices. In this lid should be left a small aperture furnished with a safety valve, and a hole should be made at the bottom of the tub, provided with a plug, in order that it may be emptied at pleasure.

Things being thus arranged, a fire is kindled under the boiler, and the ebullition is kept up during three hours. It has been ascertained that the temperature of the vapour constantly marked one hundred degrees on the scale of Reaumur's

Reaumur's thermometer during this interval. The lid of the tub is then taken off; the cloths are watered as equally as possible with fresh ley; the apparatus is closed, the ebullition is kept up as before, and in this manner you proceed for thirty-six hours. It is unnecessary to observe, that as, on the one hand, a considerable part of the water in the pot evaporates, the latter should frequently be replenished, lest it should be calcined; and as, on the other, there is a great condensation in the tub, especially immediately after the waterings, the plug should from time to time be taken out in order to empty it.

It is easy to perceive that this rude apparatus may be brought to perfection without much expense. What it is of importance now to examine is the result of the experiment, and the consequences that naturally proceed from it. The result is, that the cloths upon leaving the tub are one-third bleached, without having undergone any alteration; and that they appear so well prepared for the baths of oxygenated liquor, that if they are plunged into a bath in which twelve ounces of bleaching salt have been dissolved in one hundred pounds of water, after remaining in it eleven or twelve hours, they are taken out of a beautiful half-white. The consequences remain to be examined. In order to be more methodical, I shall propose a series of questions, which I shall undertake to resolve.

1. What action does alkali exercise on the colouring part of cloth?

2. Is alkali evaporable at the highest temperature of vapour-chambers?

3. How does the high temperature of water reduced to vapour favour the action of the alkali, and itself act on the colouring part of cloth?

Berthollet,

Berthollet, Kirwan, and other celebrated chemists, have proved that the substance which colours stuffs, made of vegetable materials, is composed of hydrogen and carbon in unknown proportions, but in which the carbon predominates; that alkalies exercise a powerful action on the colouring parts, especially when they are caustic; and, lastly, that the dissolution of the colouring parts is the more considerable, in proportion as they are better combined with the oxygen which they absorb from the atmospheric air, or which they take away from the oxygenated muriatic acid. Whether this dissolution takes place because the oxygen by combining with the hydrogen leaves the carbon by itself, or, which I think more probable, because it combines with the carbon, to form an oxyd more easily to be attacked by alkalies, is of no consequence; though we are ignorant of the cause, yet the effect cannot be denied. The dissolution of the colouring-parts by alkali is an actual combustion which cannot take place but at a high temperature. Caustic alkali has scarcely any effect upon them cold, whatever length of time the cloth may be left in the liquor; and it is known, that cloths immersed in boiling alkali are more perfectly cleared of the colouring parts than those on which it is poured, according to the ordinary custom of bleaching establishments. May not this difference probably take place only because the temperature of the liquid leys in the ley-tubs never exceeds twenty or twenty-four degrees in the upper beds of the tub? It has likewise been observed, that these upper beds always receive more benefit from the ley than the lower ones, and care is taken to place in that situation those articles which are wished to be of a good colour. Vapour-leys operate much more speedily and effectually, because the temperature of the tub or vapour-chamber is always

 kept

kept at a heat exceeding 100 degrees. The colouring part of the vegetables is more easily combustible than the vegetable texture which it covers and envelopes; that is, it burns at a much lower temperature than that texture. The degree of heat, therefore, which it would be adviseable to adopt for bleaching, should be that which destroys the colouring part without attacking the texture.

This theory is supported by the following facts: take the saccharine juice of vegetables in which carbon predominates, such as pears, grapes, onions, &c.: thicken it with gum, so as to be able to apply it, with a stick, to white cotton-stuff. Pass over this stuff an iron, heated, but not to such a degree as to burn the stuff; and you will immediately see all those parts of the stuff coloured to which you have applied the vegetable juice by means of the stick. These colours, which are quite brown, and more or less dark, according as the vegetable juice was more or less thick, are solid, and absolutely of the same nature as the colouring part of cloth: the action of oxygen and alkalies is required to destroy them.

In one of the vapour-chambers, constructed at Troyes, from the designs of M. O'Reilly, the goods cannot be watered. The hosiery, humid with alkali, is shut up in the chamber, and subjected to the action of the vapour twenty or twenty-four hours. When taken out, it is somewhat damp, like stuff that has been exposed in a fog, and has assumed in a very great degree the colour of soot. If in this state it be immediately thrown into pure water, the latter becomes discoloured, and the hosiery is taken out quite white. The lower beds are frequently soiled with large brown spots, which are very difficult to be got rid of, and are produced by the dissolution of the colouring part, which, having run down from the upper beds, dries upon the stockings, &c. on which it drops.

Do

Do not these two facts irrefragably prove that the colouring part is combustible at a lower temperature than the stuff itself? I think it unnecessary to produce others.

The second question is soon resolved; for I think it very evident that the alkali, at the temperature of the vapour-chambers, is not evaporable. If the aqueous vapour of these chambers be condensed, the water thus obtained is not at all alkaline. If paper of turnsol, coloured red by an acid, be introduced into the interior of one of them, it does not resume its blue colour, and paper stained with the tincture of Brasil wood turns red only in a very slight degree. From this observation it results, that those vast reservoirs, inwhich is always kept a great mass of alkaline solution, are perfectly useless, and that it would be much better to adopt the more simple and economical use of the copper pots already described, that construction is far less expensive, and the consumption of alkali much smaller.

The third question appears to be more complicated, but the problem is not difficult to be solved. When the cloth is kept constantly covered, and as it were enveloped with a stratum of caustic alkali, the latter acquires the same temperature as the chamber; as it has more affinity for the colouring part than the stuff itself, and as that affinity is increased in proportion to the elevation of the temperature, it acts with greater energy. When its effect is exhausted, it is necessary that it should be renewed, for two reasons; the first, to take away the portion carbonized or dissolved; the second, to furnish a new dissolvent for the portion to be carbonized or dissolved, and at the same time to defend the vegetable texture by means of a permanent humidity. If the waterings were omitted, the cloth, being no longer protected by a humid stratum of alkali, which exercises a powerful dissolving affinity over its colouring part, would become

dry; and the vapour, being brought to a great heat, which is in a manner dry and scorching, would attack the colouring part and the stuff itself, destroying both at the same time.

The illustrious Lavoisier has proved that water, at the temperature of 85 degrees of Reaumur, forms an aëriform and permanent fluid. In Papin's digester, water and vapour may be heated to such a degree as to melt tin. By way of experiment, I have frequently put into it small pieces of linen and cotton, both dry and dipped in caustic alkali. Upon taking them out, they were always more or less bleached, but generally dry, and always altered: when I increased the fire I reduced the stuff to a coal. Accidents of this kind have likewise occurred with vapour-chambers; and the bleacher of Troyes, whom I have already mentioned, and who makes use of O'Reilly's vapour machine, has been obliged to guard against them by moderating the fire under his boiler to such a degree that the texture of the stuffs cannot receive any injury. When the aqueous vapour is introduced by means of the copper pot, described above, and the surface of the cloths is kept continually wet with a substance which exercises a powerful affinity over their colouring part, there is no occasion to apprehend this kind of accidents.

It would, however, be a mistake to repeat the waterings too often: the alkali would not be allowed sufficient time to exercise its dissolving action on the colouring part; and the cloths would be nothing more than a filter, through which the alkaline liquor is continually passing. Messrs. Payen and Bourlier constructed in their manufactory at Grenelle a vapour-machine, to which they adapted a pump for watering. They thought to produce a very beneficial effect by keeping their cloths continually

nually watered with this machine, but to their great astonishment the ley was very indifferent. The machines, therefore, which keep plunging the cloth into the alkaline liquor, are perfectly useless, though they are very expensive.

I shall conclude these observations by a conjecture, for I have not been able to satisfy my doubts on this subject. May it not be possible that the vapour of water, being in immediate contact with the cloth, at a high temperature, and under a great pressure, is partly decomposed, and that its oxygen, by combining with the carbon, which is so abundant in the colouring part, oxydates it, and thus promotes its destruction by the caustic alkali? Since water is decomposed by passing through charcoal, why does not the colouring part, so rich in carbon, produce a similar effect? I am well aware that, for the decomposition of water by charcoal, an incandescent fire is required, but then a complete decomposition is obtained: at a lower temperature, might not oxydation be produced? What a vast field for experiments, equally curious and useful!

I shall terminate this discussion, by some observations on the use of oxygenated muriatic acid gas. It has been asserted, that water charged with this gas is preferable both in point of economy and effect to every other medium; and yet most bleachers prefer the use of muriate of potash or of lime. It is very probable that the multiplicity of apparatus necessary for extensive business, the difficulty of constructing them, and the quantity of gas which is disengaged during the operation, and is excessively fatiguing to the workmen, may have caused the preference to be given to the use of oxydated muriate of potash, though more expensive. But how can we explain

plain the rapid effect of that liquor when it is employed in a concentrated state? For it is a fact, that the manufacturers of Troyes, after boiling in water the cotton which they use for making coloured striped stockings, carry it to the bleacher, who, in their presence, soaks and works it in bleaching ley, and draws it out white in a few moments: whereas it requires at least two leys and two immersions in the strongest oxygenated waters to obtain a similar result. Is it not probable that this expeditious bleaching is, in this instance, the result of the combined effect of the potash and oxygen; and that while the oxygen oxydates the colouring part of the cotton, the alkali, which is always superabundant in that liquor, dissolves it even cold?

The effect of bleaching salt, the basis of which is oxygenated muriate of lime, is different. Both in price and effect it resembles water charged with oxygenated muriatic acid gas; but its action is more slow and uniform. Possessing the advantage of being transportable in casks, of having very little smell, and, in short, of being much more convenient for use, both on account of its price and effect, it bears the same proportion to oxygenated muriate of potash as one to ten; but it differs from it in this respect, that it does not act in a direct proportion to its concentration, and that instead of preserving the colours of madder, like oxygenated muriate of potash, it destroys them in the same manner as water charged with oxygen gas, but much more slowly. Bleaching salt readily gives up its oxygen at a less heat than that of boiling water. I should be tempted to believe that the colouring part produces this decomposition, by a greater affinity for the oxygen which it takes away from the lime; for that salt, when entirely neutral, and with excess of base, acts

powerfully

powerfully on cloth. In this respect it differs from oxygenated muriate of potash, which, in that state, does not act on the colouring part. I have made some comparative experiments to determine the advantages and the saving resulting from the use of these different liquors, which I shall communicate to the Society when I have brought them to a conclusion.

On the Pyrophorus. *By* J. B. Van den Sande.

From the Journal de Chimie.

THE pyrophorus which I employed for the following experiments was composed of acid, sulphate of alumine, and potash, calcined with carbon. The pyrophorus thus prepared is an hydrogenated sulphur of alumine and potash mixed with carbon.

Potash is necessary for obtaining pyrophorus; it cannot be made either with sulphate of alumine or with the acid sulphate of alumine and ammoniac, and carbon. Humidity is necessary for the inflammation of the pyrophorus; it will not take fire in a very dry atmosphere.

I placed some phosphorus beneath a glass bell, deprived of humidity; it did not take fire; but having introduced under the bell a quantity of water in vapour, by means of a blow-pipe, the pyrophorus took fire.

Having put into an air-pump a small glass vessel, well stopped, containing pyrophorus, I covered it with a recipient, provided with a leather box; after having emptied, I opened the small vessel, the pyrophorus took fire, and burned several seconds.

These

These experiments induce me to believe that the spontaneous inflammation of the pyrophorus is produced by the decomposition of the water dissolved by the atmospheric air. This liquid being attracted by the hydrogenated sulphur of alumine and potash, and by that alkali is decomposed; its hydrogen dissolves a portion of the sulphur, and forms sulphurated hydrogen gas, which taking fire by means of the caloric disengaged in great quantity from those substanees, burns with the oxygen proceeding from the decomposition of the water, and communicates its caloric to the sulphur and carbon. These two combustibles continue to burn in the atmospheric air, which they decompose, and combine with its oxygen, and are converted, the one into carbonic, the other into sulphuric acid; so that after the combustion of the pyrophorus, nothing is left but sulphate of alumine and potash.

Comparative Analysis of different Kinds of Alum.

By M. Vauquelin.

From the Annales de Chimie.

THE alum of Rome having acquired a great reputation in commerce, on account of the marked preference which the dyers give it, (for what reason it is often hard to say,) its price has become much higher than that of other alums.

This predilection has occasioned in several manufacturers the wish to give their alums the same qualities, or at least the same appearance, which the Roman alum possesses.

It appeared to me, that the most certain means of accomplishing this purpose, would be to make comparative analyses

analyses of the Roman alum and of the other species, but I was very much surprised when I came to the comparison of the results of these analyses, to find an almost perfect similarity between them.

The alums upon which I have operated are:

1. Roman alum, which I certainly knew to be such, it having been sent by a person who had himself taken it at the place.

2. Alum which is sold at Paris for Roman alum, and which had in fact all the external characters.

3. English alum, which was professed to be of the best quality.

4. Alum manufactured in the department of the Aveyron by M. * * *.

5. Alum of Liege, from whose manufacture I know not.

6. Alum manufactured in the department of the Aveyron by M. Ribaucour.

Experiment I.

I dissolved 30,5 grammes of each of these alums in equal quantities of water: I filtrated the solutions of the two Roman alums, which were not clear: there remained upon the filtre a rose-coloured powder, soft to the touch, the quantity of which amounted to nearly a hundredth part of the alum employed. I shall speak again hereafter concerning the nature of this substance.

Experiment II.

After having dissolved these alums, and filtrated the solutions which were not clear, I decomposed them by ammoniac, which I took care to add in excess. I suffered the alumines to deposit themselves; I drew off the supernatant liquor with the aid of a pump, then added

fresh, and so proceeded till the last no longer rendered the solution of muriate of barytes turbid, which required much time, and a great quantity of water.

I then threw upon filtres each of the washed alumines, and afterwards put them upon leaves of blotting-paper, in order to draw the moisture from them more expeditiously and completely.

Whilst these alumines were draining, which lasted several days, I evaporated successively to dryness, in a vessel of platina, the waters in which each of the alumines had been washed.

Those of the true Roman alum afforded of sulphate of ammoniac - - - - -	17,46 grammes.
Those of the alum said to be Roman -	17,35
Those of the alum of Liege - - -	17,78
Those of the alum of the Aveyron - -	17,83
Those of the English alum - - - -	17,78
Those of the alum of Ribaucour - -	17,46

We see here that the differences are but very small between the quantities of salt afforded by the waters of lixiviation of these alums, and that especially the Roman alums and that of Ribaucour have much resemblance in this respect, which indicates that in all these alums the quantities of acid are nearly the same. But as the alumines may have been more or less completely washed, and retain unequal quantities of salt, these results cannot suffice to afford certain information with regard to the respective quantities of acid contained in these different sorts of alums.

When the alumines had been dried upon blotting-paper, as has been said above, I calcined them in a crucible of platina, nearly at the same red temperature, and within the same space of time.

The

The following are the relations which I found between the alumines furnished by these different alums.

Alum of Rome (alumine) - - -	3,16 grammes.
Pretended Roman alum - - - -	3,18
Alum of Liege - - - - - - -	3,20
English alum - - - - - - - -	3,19
Alum of the Aveyron - - - -	3,19
Alum of Ribaucour - - - - -	3,18

These results, obtained by experiments made with care, shew that the alums, from whatever country they may be, contain the same quantity of alumine, for I do not reckon the differences of two or three hundredths of grammes which are remarked here; they are so small, and may besides as well proceed from some irregularity in the experiments, that they deserve no attention. These results shew also, that there are only about ten parts and a half of alumine in a quintal of alum.

Experiment III.

In order to ascertain exactly the quantity of concentrated sulphuric acid contained in these alums, I thought that the best method was to decompose equal quantities of them by means of muriate of barytes, carefully to collect the precipitates which are formed in this case, and to wash and calcine them.

Here is the table of the quantities of sulphate of barytes which I obtained from 100 parts of each of these alums thus decomposed.

1. True Roman alum - - - -	95
2. Pretended Roman alum - - -	94,44
3. Alum of the Aveyron - - - -	94,44
4. Alum of Ribaucour - - - -	94
5. Alum of Liege - - - - -	94
6. English alum - - - - - - -	94,44

 From

From these experiments, which were made twice with accuracy upon each species of alum, without any sensible difference, it results, that 100 parts of these salts dissolved in water, and decomposed completely by the muriate of barytes, gave at an average 94,5 of sulphate of barytes.

I observed that these precipitates were agglutinated by the calcination, and acquired hardness and transparency. It seems to me that the natural sulphate of barytes does not experience these effects from the action of fire: might they not then be owing to some foreign matter, to sulphate of alumine, or to muriate of barytes which they had carried along with them? This I cannot decide; but the case being common to all, the relations between the quantities of acid which the alums contain could not be affected.

We see from the results of the above experiments, that the quantities of sulphuric acid contained in the alums upon which they were made, are nearly equal; it is probable even that the slight differences which are remarked between them are owing merely to irregularities unavoidable in these experiments; hence we may conclude that the distinctions established between the ordinary alums and the Roman alum, for dyeing, are not founded upon the respective proportions of the sulphuric acid and the alumine.

It would not be our business to ascertain the absolute quantities of concentrated sulphuric acid contained in these alums; and this knowledge we might easily acquire if chemists were agreed respecting the properties of the sulphate of barytes; but some assert that in 100 parts of this salt there are only twenty-six parts of dry sulphuric acid; whilst others pretend to have found in it thirty-two, which makes a very considerable difference.

In

In the uncertainty under which I am left by the difference of opinion among the chemists, I shall estimate the sulphuric acid according to the two hypotheses, and we shall afterwards see which will appear to merit the most confidence.

Quantities of sulphuric acid contained in the alums, according to the hypothesis that the sulphate of barytes contains 32 *per cent.* of acid.	
Alum of Rome - - - - -	32,11
Pretended alum of Rome -	29,77
Alum of the Aveyron - - -	30,05
English alum - - - - -	32,11
Alum of Ribaucour - - -	29,31
Alum of Liege - - - - -	29,77

Quantities of sulphuric acid, according to the hypothesis that the sulphate of barytes, contains only 26 *per cent.* of this acid.	
Roman alum - - - - -	24,46
Pretended Roman alum - -	24,26
Alum of Aveyron - - -	24,41
English alum - - - -	24,46
Alum of Ribaucour - - -	23,92
Alum of Liege - - - -	24,26

Experiment

Experiment IV.

In order to ascertain the quantities of sulphate of potash existing in the different alums of which I am treating, I subjected to the action of heat the salts obtained from their decomposition by means of ammoniac; and when the sulphate of ammoniac had been entirely dissipated, I let the apparatus cool, and detached the residuum from the crucible.

The weight of these residuums were to each other as follows:

1.	That of the Roman alum - - -	6,50
2.	——— pretended Roman alum	6,54
3.	——— alum of the Aveyron -	6,40
4.	——— English alum - - - -	6,53
5.	——— alum of Lege - - - -	6,50
6.	——— alum of Ribaucour - -	6,65

I afterwards examined these salts in order to ascertain whether they did not contain still more particles of sulphate of ammoniac; but I could not discover the slightest trace of it; at least neither caustic potash nor quick-lime, aided with a little water, developed in it any odour of ammoniac.

On tasting these salts, I perceived that they were slightly acid, which was also confirmed by their reddening the tincture of turnsol to a considerable degree.

We see here that, at an average, these alums contain 6,52 grammes to 30,5 of sulphate of potash, or about 20 *per cent.* supposing that this sulphate of potash does not retain any excess of sulphuric acid. We also find from this result, that I committed a great error in my first enquiry respecting alum, when I estimated the quantity of sulphate of potash in this salt at only 7 *per cent.*

This

This error proceeded apparently from my having too strongly heated the salt resulting from the decomposition of the alum by the ammoniac, and having volatilized a part of the sulphate of potash.

The acidity of the sulphate of potash which remains after the volatilization of the sulphate of ammoniac proceeds from the decomposition of a part of the latter. We know, in fact, that when we heat the sulphate of ammoniac, a portion of the alkali escapes at the first moment in all its purity, the salt passes into the state of acidulous sulphate, which requires a higher temperature for its volatilization, and in the case in which we speak this portion of acid is taken by the sulphate of potash, which retains it much more strongly. During the decomposition of the sulphate of ammoniac, a part of the principles of this salt also undergoes a mutual decomposition, for there is formed a large quantity of sulphate of ammoniac. It seems very probable, that a portion of the hydrogen of the ammoniac unites with a part of the oxygene of the sulphuric acid; however, as there is developed in this operation a considerable quantity of carbonous matter, which appears to be dissolved in the ammoniac, this matter may possibly in part be the cause of the formation of the sulphate of ammoniac.

Most of the sulphates of potash obtained by the means which have been described, dissolved in water, gave, by evaporation, slight traces of sulphate of lime, but the quantity of it is almost inappreciable; it certainly does not amount to $\frac{1}{2000}$. It is remarkable, that ammoniac precipitates from the solutions of these sulphates of potash a small quantity of red oxyde of iron mixed with a very minute portion of alumine. This proves that the ammoniac which has been employed for decomposing the alum has not precipitated the iron from it; for the quantity

tity which is found again here, is nearly the same as that which I have obtained by a direct experiment, as shall be seen hereafter. It appears that the iron is this circumstance forms a triple salt with the sulphate of ammoniac, which an excess of this alkali does not decompose. The sulphate of potash extracted from the Roman alum also gave a small quantity of this oxyde of iron.

TO BE CONCLUDED IN OUR NEXT.

Memoir on the Sulphate of Magnesia. By J. Mojon.

From the Journal de Physique.

(Translated from the Italian.)

ONE of the national productions of great importance, and which might be made to produce a considerable profit, is the Cathartic salt, or English salt, (sulphate of magnesia, Epsom salt,) which is prepared at present on the borders of the mountain of La Guardia.

The utility of this salt in medicine, its indispensable necessity for the preparation of good magnesia, and the great consumption which is made of it, have given rise to the establishment of a manufactory of this salt, in which, by means of a very ingenious process, some pyrites are converted into a salt which they do not contain in their natural state, which ought to draw our attention to a process whereby Ligurian industry turns to such good account materials presented to it by the sterility of its mountains.

The mountain of La Guardia, from which the pyrites containing the materials of this salt is obtained, is situated north-east of Genoa, at a distance of eight miles from that city, and six miles from Sestri, to the west; it

it is contiguous to the north with Torbi and Ceraresi, and to the east with the stream of the Solcevera, to the south with the mountain Del Gaze and Tirolo, and to the west with the river Varenna. Its greatest elevation above the level of the sea is about 20,000 feet; it is formed of primitive schistus in parallel strata, obliquely inclined, for the greater part of a mixed grey and reddish colour, intermingled with serpentine, and intersected by veins of pyritous schistus, of iron and copper. These metallic veins penetrate into the mountain generally in a direction from south-east to north-east, with more or less inclination towards the horizon; they are the most abundant on the border of the southern part of the mountain, which, advancing towards Sestri, describes a semi-circle, of a mile in extent, which takes the name of Monte Ramazzo (coppery mountain) from the copper-colour of the stones which cover it: its surface is naked, and almost destitute of vegetables. As for the pyritous veins which traverse it, some abound only in ferruginous pyrites, united with argillaceous schistus, compact, brilliant, of a metallic grey colour, and of a specific weight, which, compared with that of water, is as 4,485 to 1,000; the others contain, besides iron, a considerable quantity of copper, and present a degree of coloration which in part indicates their respective richness: these last are of a bronze or greenish-yellow colour, more tender than the preceding, soft to the touch; their specific weight is 3,621 to 1,000. The abundance of these pyrites, and their metallic aspect, has at all times given rise to the wish of turning them to some advantage, and has led to experiments; but the want of the chemical knowledge which such an undertaking required, obliged the speculators to confine themselves to the extraction of the copper and of the green vitriol (sulphate of iron).

Some time after, M. Morando, continuing the fabrication of the sulphate of iron, saw that it became whitish, and that it had not the fine green colour of that of commerce; wishing to know the cause which produced this diversity of colour, he perceived that among the crystals of vitriol there were some white ones, in quadrangular prisms, which had all the physical properties of the sulphate of magnesia.

Having confirmed his discovery by the analysis which he made of these crystals, he endeavoured to decompose, by means of lime, the portion of sulphate of iron which was mixed with it; in this manner he succeeded in obtaining separately the pure sulphate of magnesia; a manufacture to which he gave the preference, neglecting that of the sulphate of iron as impure, and less advantageous. After having continued for several years to manufacture this salt with utility, and not being able to occupy himself any longer with it, he resolved to relinquish the direction of it to others.

At last M. Ansaldo, notwithstanding the unfavourable times, and all the difficulties which lay in his way, undertook the enterprise; he directed himself the operation, and succeeded in bringing into activity this valuable national manufacture, varying the processes, and ameliorating the quantity of the product.

The present method of preparing this salt at La Guardia consists in extracting the pyrites by means of holes, which have a diameter from eight to twelve feet, and extend along the metallic vein by a kind of road from 200 to 400 feet; it is hollowed out without the aid of any gallery, because the vault has very little inclination; in some of these hollows lakes of water are formed, which prevent the labour from being pursued; in such cases the workmen are obliged to open canals underground, in

order

order to favour the exit of the stagnating water, and enable them to dig farther. After having extracted the pieces of ore, they are torrified by disposing them round the inner sides of a kind of oven or pit, of an eliptical figure, dug in the earth, and having eighteen feet diameter to a depth of twenty, with an opening in the bottom, destined to receive the fire, and at the same time to give access to the current of air necessary for the combustion. The wood is introduced into the middle of the oven, and covered with other pieces of mineral, placed in the form of a vault; this being done, the fire is applied by the inferior opening, which has an external communication by means of a chamfer made in the earth, and the combustion is continued during eight days. When the oven has cooled, which happens twenty days after, the torrified pyrites is collected, and conveyed under a shed, where it remains exposed to the air for six months, sheltered from the rain. During this time water is several times sprinkled upon the pyrites, which, as it decomposes the liquid and the atmospheric air, absorbs their oxygen; in this state it is friable, pulverulent, covered with a saline substance, and the sulphuret is converted into sulphate: this kind of efflorescence being completed, all the mineral is lixiviated, and the liquor is poured into a large wooden tub, the bottom of which contains a layer of straw, covered with a layer of siliceous sand, with a lateral hole for the liquor to run off when it has filtrated through the layers of straw and sand; the liquid thus obtained holds in solution the sulphate of iron, of copper, and of magnesia, from which the latter salt is separated, by decomposing the two first, by means of whiting, till the liquor has no longer any colour, and is perfectly clear. When the workmen perceive that the mineral abounds in copper, and that the ley is blue, before pour-

 ing

ing the whiting upon it, they immerse in it for some days small plates of iron, in order to obtain a certain quantity of copper. After the metallic sulphates are entirely decomposed by the lime, which forms with the sulphuric acid a sulphate of lime which is precipitated with the oxydes, the liquor is filtrated anew, evaporated in a large copper caldron, and put to crystallize in small glazed earthen vessels; twenty-four hours after the sulphate of magnesia is found crystallized at the bottom and round the sides of the vessel; the supernatant liquor is decanted, and the salt dried upon large tables. As some buyers cannot recognize the sulphate of magnesia unless in small crystals, in needles, the workmen are obliged frequently to stir the liquor, in order to disturb the crystallization, and to break the crystals which form.

The residue of the mineral which remains in the tub of the first filtre contain still much pyrites; it is torrified a second time, and the whole first operation is repeated; but in this second the ley which we obtain gives a less quantity of sulphate.

All the veins of this ore do not afford the same quantity of salt, and they do not all require to be torrified for the same length of time, and the same number of lixiviations; some are found of a tender friable nature, which afford salt by simple lixiviation, without requiring the first torrifaction; others, on the contrary, are more hard, compact, and require greater torrefaction.

The quantity of sulphate of magnesia which is obtained by the repeated torrifactions and lixiviations, generally amounts to a tenth part of the mineral employed, and the lime requisite for the decomposition of the metallic sulphates corresponds to about a hundredth part of the mineral.

According

According to the process which I have just described, it is easy to comprehend the theory of this operation, and the manner in which the sulphate of magnesia is formed in this circumstance, without its being necessary for me to demonstrate that the sulphur contained in the pyrites attracting the oxygene of the atmosphere, by means of the action of the caloric, and of its exposure to the air, is converted into sulphuric acid, which acid, combining with the metallic oxydes and the magnesia, forms sulphates of iron, of copper, and of magnesia: the lime decomposes the two first, and forms a sulphate of lime, which remains upon the filtre with the two metallic oxydes.

I deem it however necessary to observe, that not all the sulphate of magnesia obtained by the process described results from the materials which the mineral furnishes, but that a considerable portion of it is formed at the expense of the magnesia which is frequently found in the lime that is employed; by the same reason such lime as is richest in magnesia produces more salt than that which contains less. It results, from comparative analyses of the different limes of this country, that 100 parts of that of Gazo contain eighty-four parts of lime and sixteen of magnesia; that of Coroleto 0,04 of magnesia and the rest of lime; that of Vado 0,05; of Iso-verde 0,08; that of Saravanico 0,07; that of Signone 0,05 of magnesia; so that the lime of Gazo is the best adapted for the fabrication of this salt, the nearest to the ore, and consequently the most economical.

TO BE CONCLUDED IN OUR NEXT.

Note

Note on Black Dyes, and the Fabrication of Inks.

By M. Roard.

From the Annales de Chimie.

Before chemists made inquiries upon the nature of ink, it was generally nothing but the result of clumsy recipes and mixtures, more or less complicated, the speedy destruction of which afforded no security or stability to written deeds, either public or private. Lewis was the first who, comparing together both the processes and the substances employed for obtaining it, shewed that its perfection depended only upon exact and well determined proportions of galls, copperas, and gum. In a very extensive labour upon this subject, Rebaucourt did not content himself with examining its principles, and the mode of their mutual action; but he also established the differences which ought to exist between the baths for dyeing black and the composition of ink. But the phenomena which take place in all the operations of this kind were already known for some time past by M. Berthollet's fine experiments upon dyeing: he had proved that, in the combination of the astringent with the iron, the black colour is owing to the twofold cause of the reduction of the oxyde restored to the state of black oxyde, and to the development of a more or less considerable quantity of carbone, in proportion to the oxygene absorbed. It was much to have arrived at the ability to procure, in a constant manner, a fine black colour; but it was still required to render it fixed and very solid; and it was then seen, that the carbone, by combining with the colouring substances, could alone secure them against destruction. Pitel announced that he had discovered an ink which could not be attacked by any of the known agents;

agents; but when it had been carefully examined, opinions were divided; for Gruner and Wehrs destroyed it by means of caustic potash and oxygenated muriatic acid, whilst Wiegleb and Torey found that it resisted even the action of these two powerful re-agents. Westrumb, who had occupied himself much with these researches, having discovered that indigo formed a part of Pitel's ink, proposed a process which gives, according to this assertion, an indestructible ink. To a mixture, in determinate proportions, of Brazil wood, galls, copperas, gum, and sugar, he adds a part and a fourth of good indigo, pounded very fine, and three-fourths of perfectly purified lamp-black. Some chemists, who knew the impossibility of obtaining a fixed and solid ink by making the sulphate of iron enter into its composition, sought for a more simple means of procuring it, by extracting it from the vegetable substances which appear to offer it us spontaneously. Bosse, adopting the ideas of Murray, made many experiments upon the juices of plants; but though he obtained from several of them a liquor which was unattackable by the oxygenated muriatic acid, the colour did not appear to him to be sufficiently deep, and he therefore abandoned experiments which he had very successfully commenced. However, we knew that a great number of substances, both indigenous and exotic, such as the Genipa Americana, Actea Spicata, the black-berried heath, some species of Toxicodendron, the Anacardium, the Marrubium Aquaticum, and especially the Croton Cascaralla, may furnish a fine black colour in abundance. The numerous experiments made upon this matter have given us sufficient information to know how we may arrive at the solution of this problem, which consists in finding the solvent of the carbone. We are the better authorized to hope that we shall find it, as we are very

very able to dissolve the substances which contain it in the greatest quantity, such as indigo, wallnut-rind, oak-bark, and galls, which, on account of this same property, have become, in dyeing, the base of the most solid colours.

M. Bouillon Lagrange, availing himself of the knowledge which we posssseed respecting the astringents, has arrived at very happy results for obtaining a fine black colour proper for hat-making, dyeing, and the fabrication of inks, by substituting, in place of the gum, galls and copperas, other indigenous substances. His preparations, which are as beautiful and as solid as any of this kind which we already possess, have very considerable advantages over them, namely, those of being able to be fabricated in a constant manner, and at a price much inferior to any of those which we meet with in commerce.

List of Patents for Inventions, &c.

(Continued from Page 320.)

JOHN BROWN, of the town of Poole, in the county of Dorset, Merchant; for improvements in the wheels of carriages, applicable also to windlasses, capstans, and various other useful purposes. Dated August 4, 1804.

WILLIAM PETHER, of the parish of St. Michael, in the city of Bristol; for certain methods, on a new principle, either for preventing or curing smokey chimnies. Dated August 4, 1804.

WILLIAM WARRIS, of Sheffield, in the county of York, Optician; for an improvement in the mounting of glasses, commonly called Opera Glasses. Dated August 4, 1804.

EDWARD GREAVES, of Sheffield, in the county of York, Razor-manufacturer; for improvements on razors. Dated August 4, 1804.